

Environmental Assessment for the Atlantic Rim Coalbed Natural Gas Development Project, Brown Cow II POD Carbon County, Wyoming

Wyoming State Office — Rawlins Field Office



July 2006

MISSION STATEMENT

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WY-030-06-EA-194



United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Rawlins Field Office
P.O. Box 2407 (1300 North Third Street)
Rawlins, Wyoming 82301-2407



In Reply Refer To:
1790

July 28, 2006

Re: Environmental Assessment for the
Atlantic Rim Interim Drilling:
Brown Cow II POD CBNG Project

Dear Reader:

This is to inform you of the availability of the Brown Cow II POD Coalbed Natural Gas (CBNG) Development Project (Project) Environmental Assessment (EA) at the Wyoming Bureau of Land Management's (BLM) website:

www.wy.blm.gov/rfo/nepa.htm

The Brown Cow II POD Project is a coalbed natural gas project associated with the Atlantic Rim Natural Gas Field Development Project. The Brown Cow II POD is located in one of several areas proposed for interim drilling to provide information to the BLM and proponents, and reduce leaseholder hardship during preparation of the EIS. In order to satisfy the requirements of the National Environmental Policy Act, this EA was prepared to analyze impacts associated with the construction, drilling, production, maintenance, and reclamation of natural gas wells north of Baggs, Wyoming.

It is expected that this EA can be viewed at our website beginning July 28, 2006. This will begin the 30-day public review/comment period for the document. We will review all comments and will address substantive comments in the Decision Record. A substantive comment is one that would alter conclusions drawn from the analysis based on: (1) new information, (2) why or how the analysis is flawed, (3) evidence of flawed assumptions, (4) evidence of error in data presented, and (5) requests for clarification that bear on conclusions presented in the analysis.

Your comments should be as specific as possible. Comments on the alternatives presented and on the adequacy of the impact analysis will be accepted by the BLM until August 28, 2006.

Comments may be submitted via regular mail to:

Travis Bargsten, Project Manager
Bureau of Land Management
Rawlins Field Office
P.O. Box 2407
Rawlins, Wyoming 82301-2407

Comments may also be submitted electronically at the address shown below (please refer to the Brown Cow II POD Project):

e-mail: rawlins_wymail@blm.gov

Please note that comments, including names, e-mail addresses, and street addresses of respondents, will be available for public review and disclosure at the above address during regular business hours (7:45 a. m. to 4:30 p. m.), Monday through Friday, except holidays. Individual respondents may request confidentiality. If you wish to withhold your name, e-mail address, or street address from public review or from disclosure under the Freedom of Information Act, you must state this plainly at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, well be made available for public inspection in their entirety.

The EA may also be reviewed at the following locations:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, Wyoming 82009

Bureau of Land Management
Rawlins Field Office
1300 N. Third Street
Rawlins, Wyoming 82301

If you require additional information regarding this project, please contact Travis Bargsten, Project Manger, at the Rawlins address shown above or phone (307) 328-4387.

Sincerely,



Field Manager

Enclosure

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION

1.1.1 Description and Location

Anadarko Petroleum Corporation (APC) and Warren E & P, Inc. have submitted notification to the Bureau of Land Management (BLM) Rawlins Field Office (RFO) that they would like to explore and produce coalbed natural gas (CBNG) reserves in the 3,692-acre Brown Cow II Project Area (BCII PA). This proposal arises from interim exploration to determine the presence and extent of CBNG within the Atlantic Rim Project Area (ARPA) for which an Environmental Impact Statement (EIS) is being concurrently prepared by the RFO. The BCII PA is located in Carbon County and is approximately 7.5 miles north of the Town of Baggs, just east of State Highway (SH) 789 (**Figure 1-1**). The Project Area is entirely located on Federal sections administered by the RFO.

This project would consist of constructing, drilling, completing, testing, and operating 12 new CBNG wells. Ancillary facilities connected to the project include access roads, utilities, flowlines, and production facility.

1.2 PURPOSE AND NEED FOR ACTION

1.2.1 Purpose and Need for the Proposed Project

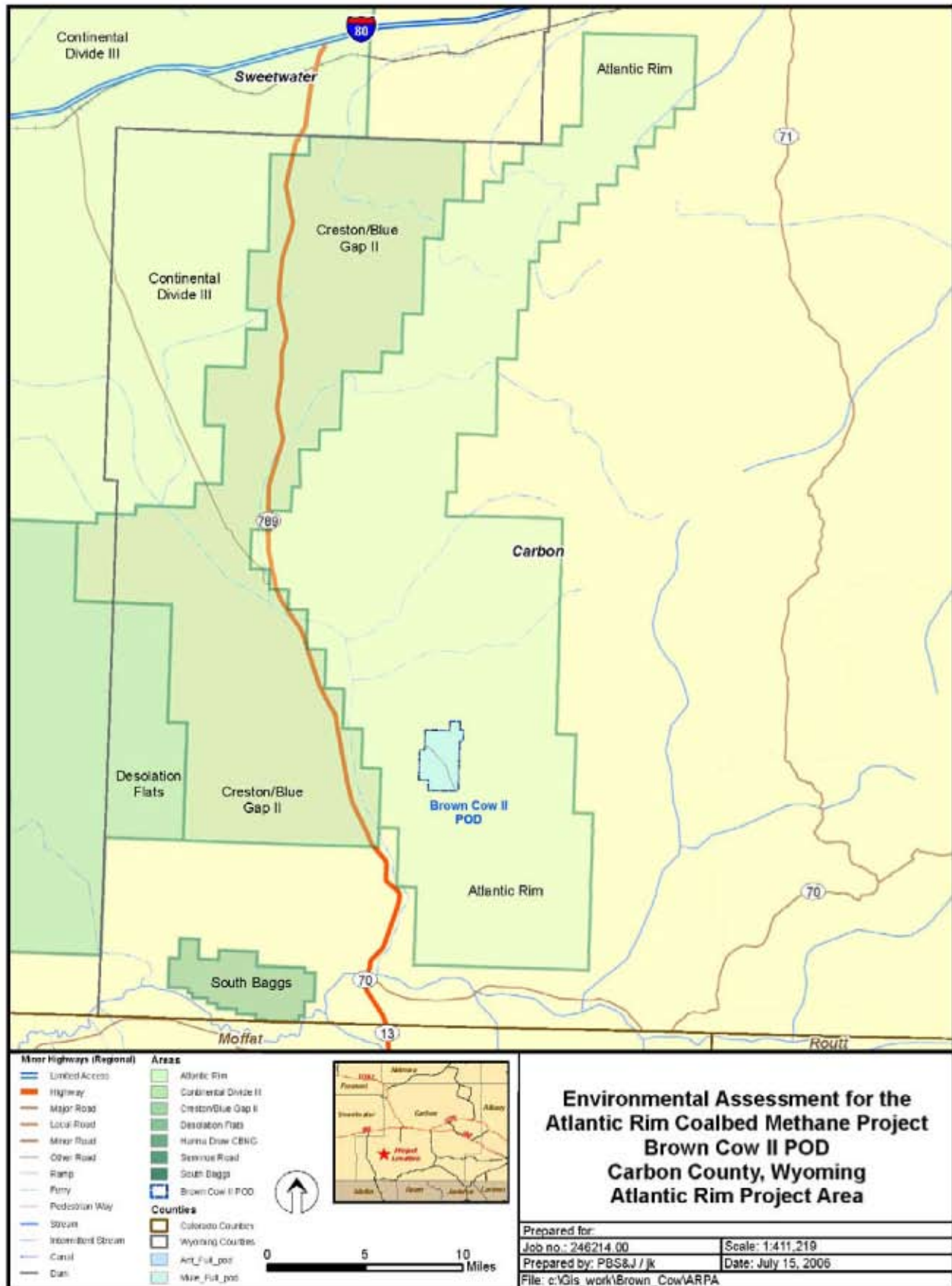
The purpose of the Proposed Action is to exercise the Operator's valid lease rights and extract CBNG as part of an ongoing effort to determine if the ARPA contains marketable quantities of this natural resource. The implementation of the proposed project would accomplish the following:

- Contribute natural gas to the national market;
- Reduce national dependence on potentially unstable foreign sources of energy;
- Contribute to the national supply of a clean-burning fuel;
- Allow the Operators to develop natural gas pursuant to their rights under existing oil and gas leases granted by the BLM and the State of Wyoming;
- Development of the 12 wells would bring the total number of active wells in the Brown Cow Project Area to 24. This would represent full development (24 wells) within this Project Area, as specified in the Atlantic Rim Interim Drilling Plan; and
- Reduce leaseholder hardship during preparation of the Atlantic Rim EIS.

Natural gas is an integral part of the United States energy future due to its availability from domestic sources and the presence of an existing market delivery infrastructure. The proposed project is also needed for the following reasons:

- Natural gas production would result in the generation of Federal and State tax and royalty revenues;
- Developing the gas resources would support local economies by providing and maintaining employment opportunities and expanding the tax base; and
- The environmental advantages of natural gas use for energy versus other conventional fuels are emphasized in the 1990 Clean Air Act (42 USC 7671 *et seq.*).

Figure 1-1
Location of Brown Cow II Project Area



1.2.2 Environmental Analysis Process

The BLM is required to prepare this Environmental Assessment (EA) to analyze and determine whether any significant impacts may occur in connection with the Proposed Action, as stipulated in the National Environmental Policy Act (NEPA). This EA documents the analyses conducted on the proposal and alternatives to identify environmental effects and mitigation measures. In addition, this document is utilized for public review and comment on the Proposed Action, the environmental analysis, and mitigation measures.

Factors considered during the environmental analysis for this Proposed Action include the following:

- A determination of whether the proposal and alternatives conform to BLM policies, regulations, and the direction approved in the Great Divide Resource Management Plan (RMP).
- A determination of whether the proposal and alternatives conform to policies and regulations of other agencies that are likely to be associated with the project.
- A determination of well pad locations, access roads, pipelines, and ancillary facilities that meet resource management objectives and minimize impacts to surface resources.
- A determination of impacts on the human environment that may result from the Proposed Action and development of mitigation measures necessary to avoid or minimize potential impacts.

1.3 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS

This EA is prepared in accordance with NEPA and complies with all applicable regulations and laws passed subsequent to the Act. In addition, this EA is prepared utilizing the stipulations and format outlined in the BLM NEPA Handbook (H-1790-1).

1.3.1 Conformance with Great Divide Resource Management Plan

The Great Divide RMP and Record of Decision (ROD) (BLM 1987, 1988, 1990) direct management of the RFO-administered lands within the BCII PA. As stated in the RMP, oil and gas development on BLM-administered lands consists of leasing, exploration, and development of these resources while ensuring the protection of other resource values. As stipulated in the RMP, all BLM oil and gas leases are subject to site-specific conditions of approval (COAs) attached to applications for permits to drill (APDs).

1.3.2 Relationship to Other Plans and Documents

The proposed project conforms to the State of Wyoming Land Use Plan (Wyoming State Land Use Commission 1979) and the Carbon County Land Use Plan (Pederson Planning Consultants 1997, 1998) and would comply with all relevant Federal, State, and local regulations. In addition, development of this project would not affect attainment of the Wyoming Standards for Healthy Rangelands, produced in August 1977 then updated in May 2003 (BLM 2003).

1.3.3 Issues and Concerns

The following environmental, social, and management issues associated with the BCII PA have been identified:

Water Resources

1. Groundwater resources could be affected by energy development in the BCII PA.

Wildlife Resources

1. Greater sage grouse leks and nesting sites may be affected by surface disturbance, vehicle traffic, and human presence.
2. Crucial winter range for mule deer may be affected by project activities.
3. Nesting raptors could be affected within the BCII PA.
4. Potential mountain plover habitat may be affected within the BCII PA.

Rangeland and Livestock Grazing

1. Protecting quality rangeland is a management concern in the BCII PA.

Soil Resources

1. Soils could be affected within the BCII PA.

Cultural Resources

1. Impacts to cultural resources are a concern in the BCII PA.
2. Impacts to historic trails are a concern in the BCII PA.

Other Issues

1. Cumulative impacts to natural resources are an issue in the ARPA.
2. Impacts to air quality are an issue in the ARPA.
3. Noxious weeds are a concern in the BCII PA.

Mitigation

1. Use of proper Best Management Practices (BMPs) during construction is required.
2. Reclamation of all disturbed areas is a management concern.
3. Surface disturbance is not recommended on slopes in excess of 25%.
4. All disturbed areas will be reseeded with the BLM recommended seed mixture.
5. Noxious weed infestation will be monitored on disturbed sites.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 ALTERNATIVE 1 – PROPOSED ACTION

This proposed exploratory project (Alternative 1 – Proposed Action) submitted jointly by Warren E & P, Inc. and APC, consists of exploration and interim development of natural gas resources on Federal and fee leases in the BCII PA. The proposed location of wells and associated facilities is shown in **Figure 2-1**, and in **Exhibit 1** of the Master Surface Use Plan (MSUP), Appendix A.

The Proposed Action consists of constructing, drilling, completing, testing, operating, and reclaiming 12 new exploratory wells, the conversion of four existing wellbores to deep injection wells, and the drilling of one deep injection well at an existing well location to dispose of produced water. Related access roads, utilities, flowlines, pipelines, and production facilities are also planned for the Proposed Action. The location, lease number, well name, and well number of each well planned for the BCII PA are shown in **Table 2-1**.

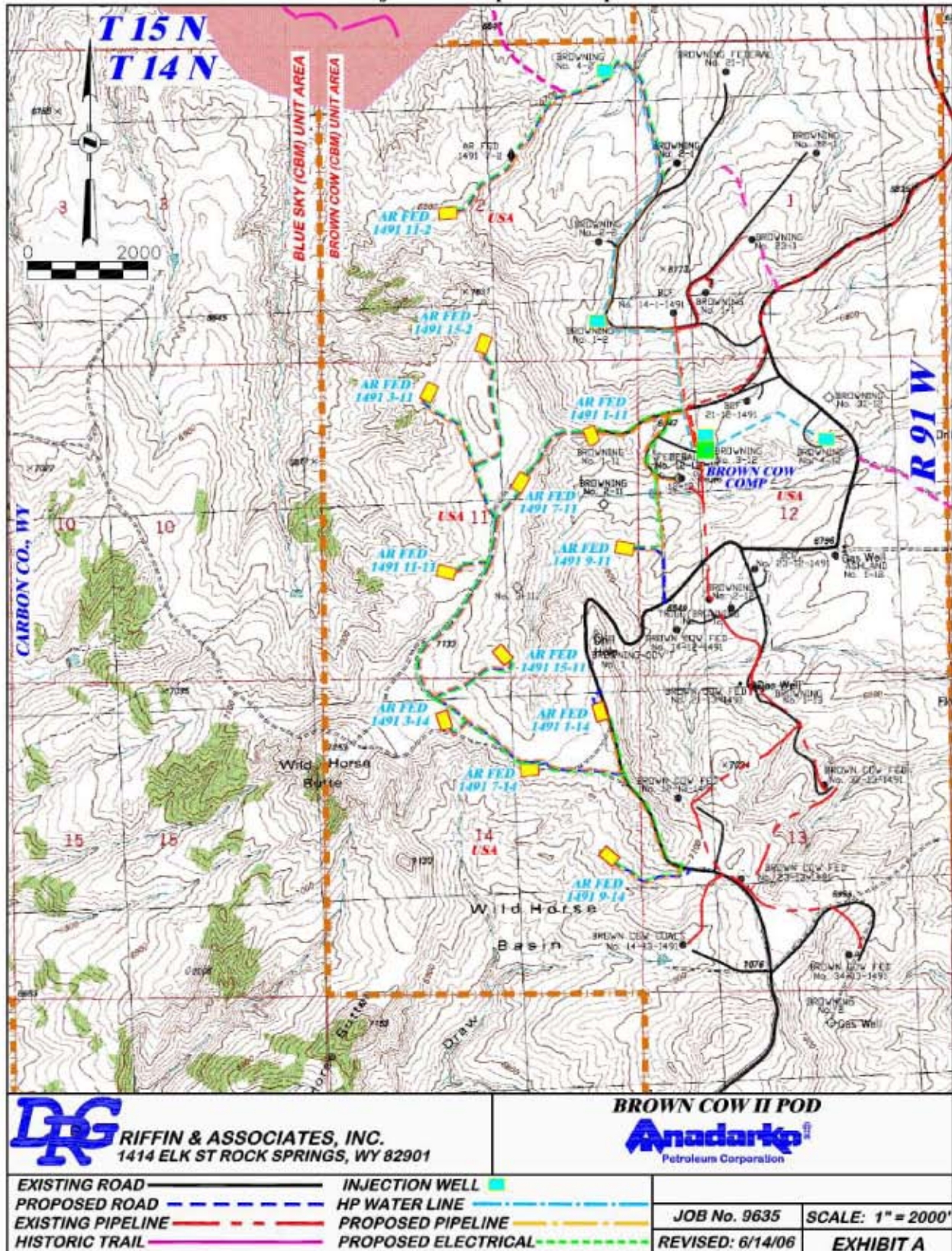
The proposed project is accessible from the Town of Baggs, Wyoming by traveling approximately 7.5 miles north on SH 789. The project is one of nine specified exploration areas subject to interim exploratory drilling within the Atlantic Rim Natural Gas Development Project area. All 12 proposed CBNG wells and four of five injection well locations are located on BLM RFO-administered Federal surface and mineral estate. The remaining injection well (15-36-91) is located on State of Wyoming surface and mineral estate.

The Proposed Action falls within guidance prepared as part of interim drilling activities associated with the Atlantic Rim EIS in Carbon County, Wyoming. The primary objective of interim drilling is to evaluate the following aspects of gas development in the ARPA:

- Productivity of the coals,
- Economics of drilling and completion techniques,
- Feasibility of dewatering the coals,
- Depths or pressure windows that may be preferred as the target for economic gas production, and
- Reduce leaseholder hardship during preparation of the Atlantic Rim EIS.

In addition, the RFO must determine through a NEPA analysis that no significant or adverse impacts would occur with the proposed development. With a Finding of No Significant Impact, this project will comply with Council on Environmental Quality (CEQ) regulations regarding activities allowable during concurrent EIS preparation (40 CFR 1506.1).

Figure 2-1
Project Development Map



**Table 2-1
Brown Cow II Project**

Lease Number	Well Name	Location
WYW-029262	AR Federal 1491 11-2	NE SW 2-T14N-R91W
	AR Federal 1491 1-11	NE NE 11-T14N-R91W
	AR Federal 1491 7-11	SW NE 11-T14N-R91W
	AR Federal 1491 9-11	NE SE 11-T14N-R91W
WYW-0208269	AR Federal 1491 15-2	SW SE 11-T14N-R91W
WYW-131274	AR Federal 1491 3-11	NE NW 11-T14N-R91W
	AR Federal 1491 11-11	NE SW 11-T14N-R91W
	AR Federal 1491 15-11	SW SE 11-T14N-R91W
WYW-136207	AR Federal 1491 1-14	NE NE 14-T14N-R91W
	AR Federal 1491 3-14	NE NW 14-T14N-R91W
	AR Federal 1491 7-14	SW NE 14-T14N-R91W
	AR Federal 1491 9-14	NE SE 14-T14N-R91W
Deep Injection Wells		
WYW-0208269	API 49-007-20978	SE SE 2-T14N-R91W
WYW-0208269	API 49-007-20750	SW NW 12-T14N-R91W
WYW-0208269	API 49-007-20980	W NE 12-T14N-R91W
WYW-0208269	API 49-007-21052	NE NE 2-T14N-R91W
ST 93-00078	API 49-007-21513	SW SE 36-T15N-R91W

The Wyoming Oil and Gas Conservation Commission (WOGCC) established an 80-acre well spacing pattern for wells completed in the Mesaverde Group in the BCII PA. Spacing for this area was established under Cause No.1, Order No. 1, Docket Nos. 157-2001 and 113-2002.

Interim drilling within the BCII PA would occur over a six to 12-month period. Wells would be tested for six to 12 months to fully evaluate the economics of any additional development. The life of the project is estimated to be between 10 and 20 years. The productive life of a gas well completed in Mesaverde Group coals is estimated to be 15 years.

Specific components of the proposed project are shown in the MSUP (Appendix A), Master Drilling Plan (MDP) (Appendix B), and the project development map (**Figure 2-1**). Project plans are summarized below in the section titled “Plan of Development.” Where feasible, existing infrastructure will be used or upgraded.

Refer also to Section 2.1.10.1 of this Chapter for Applicant-Committed Mitigation Measures.

2.1.1 Plan of Development

The Proponents will follow the procedures outlined below to gain approval for the activities proposed for the BCII PA. Development also will be approved, as required, by other agencies.

2.1.2 Preconstruction Planning and Site Layout

The Proponents have submitted Federal APDs and Right-of-Way (ROW) applications, along with a MSUP, MDP, and a project map to the RFO that shows the specific location of the proposed activities (such as individual drill sites, pipeline corridors, access roads, and other facilities). The applications include site-specific plans and mitigation measures that describe the proposed development (drilling plans with casing/cementing program, surface use programs with construction details for roads and drill pads, and site-specific reclamation plans). Approval of all planned operations will be obtained in accordance with the applicable regulations and Onshore Oil and Gas Order No. 1 (Approval of Operations on Onshore Federal and Indian Oil and Gas Leases). Stormwater discharges during construction would be managed in accordance with a stormwater permit issued by the Wyoming Department of Environmental Quality (WDEQ). Water disposal is authorized through the WOGCC.

The proposed facilities have been staked by the Proponents and inspected by an interdisciplinary team (IDT) from the BLM to verify consistency with the approved RMP, applicable rules and regulations, appropriate BMPs, and stipulations contained in the oil and gas leases. As appropriate, the BLM will add COAs to mitigate environmental consequences of the Proposed Action or to ensure compliance with applicable rules, regulations, and BMPs.

A general discussion of proposed construction techniques to be used for the proposed project is described in the following sections. For a complete description of the Proposed Action, refer to Appendices A and B (MSUP and MDP, respectively). These construction techniques apply to drill sites, pipelines, and access roads within the BCII PA and may vary among well sites.

2.1.3 Construction Phase

2.1.3.1 Construction of Access Roads

The BCII PA is accessible from Baggs, Wyoming by traveling approximately 7.5 miles north on SH 789 then turning right onto BLM Road 3309 for approximately 5.5 miles until entering the Browning Field operated by Anadarko E & P Company LP.

All existing and proposed access roads would be constructed and maintained to minimum standards for a BLM Resource Road, as outlined in BLM Manual 9113. The Operator proposes to upgrade and construct approximately 25,902 feet of new road to access the proposed pad facilities. The travel-way would have a running surface approximately 14 feet wide, except for turnouts, and the disturbed roadway width would be 50 feet. Road construction would result in 29.7 acres of short-term surface disturbance. All roads would be surfaced with gravel for the duration of production operations. Upon reclamation of the road disturbance not necessary for road use/maintenance, it is expected that the long-term (life of project) disturbance width would equal 30 feet, yielding a long-term disturbance area of 17.8 acres.

Maintenance of the roads used to access well locations would continue until final abandonment and reclamation of the well locations. A regular maintenance program would include, but is not limited to, blading, ditching, culvert installation and cleanout, weed control, and gravel surfacing where excessive rutting or erosion may occur. Existing roads would be maintained in a safe and usable condition.

Drainage crossings along access roads would be maintained with culverts (a minimum of 18 inches in diameter) Rip-rap would be added at the outlet of each culvert to minimize erosion. Additional culverts would be added as the need arises, or as directed by the BLM's Authorized Officer.

2.1.3.2 Well Pad Design and Construction

Information on each Federal well is contained in the BLM APD Form 3160-3, Well Survey Plat, and Well Pad Cross Section on file with the BLM. Surface disturbance would be kept to a minimum at each well location. Each well pad would be 300 feet by 200 feet, which includes the reserve pit but not the area for temporarily storing topsoil, spoil piles, and the cut and fill slopes. Each well pad would be leveled using cut and fill construction techniques, where needed. The top six to eight inches of soil (more if available) and associated vegetative material would be removed and stockpiled prior to constructing each well pad. Drainage ditches would be constructed as necessary to divert stormwater away from each well pad. It is estimated that each well pad would disturb approximately 2.0 acres in the short-term, or until interim reclamation is completed. After interim reclamation, each well location would result in a 0.25-acre long-term disturbance for the life of the project.

The Proponents plan to use one reserve pit at each drilling location (30 feet by 70 feet), which would be designed and constructed according to WOGCC and BLM requirements. The reserve pit would be open for an estimated two to eight weeks to allow for evaporation of pit fluids. During this time, the pit would be closed off from wildlife and livestock by two strands of barbed wire above a woven wire fence.

2.1.4 Drilling and Completion Operations

A conventional drilling rig would be used to drill the gas wells. Additional equipment and materials needed for drilling operations would be trucked to the drill location.

Water for use in drilling the wells would be obtained from existing wells completed in the coal seams of the Mesaverde Group. Approximately 700 barrels of water (almost 30,000 gallons) would be needed to drill each well. The actual volume of water used in drilling operations would depend on the depth of the well and any losses that might occur during drilling. Approximately 70,000 gallons of water per well would be needed for preparation of cement, approximately 14,000 gallons of water per well would be needed for stimulation of the well, and approximately 55,440 gallons of water per well would be needed to control dust. In all, nearly 170,000 gallons (approximately 0.5 acre-feet) of water per well would be used. Dust abatement using produced water will comply with all applicable WOGCC, WDEQ, and BLM requirements. Only water suitable for livestock use would be used for dust abatement and only disturbed areas would be sprayed.

No oil or other oil-based drilling additives, chromium/metals-based mud, or saline mud would be used during drilling of the proposed wells. Only fresh water, biodegradable polymer soap, bentonite clay, and non-toxic additives would be used in the mud system. Details regarding the mud program are incorporated within the MDP. The proposed wells would not produce oil or salt water typical of oil production. Furthermore, other liquid hydrocarbons are not anticipated. Should unexpected liquid petroleum hydrocarbons (e.g. crude oil or condensate) be encountered during drilling or well testing, it would be contained in on-site test tanks.

Depending on the location of the coal seam, each producing well would be drilled to an approximate depth of 2,025 feet to 3,325 feet. Natural gas in the coal seam would be produced through perforations in the casing. The well control system would be designed to meet the conditions likely to be encountered in the hole and would conform to BLM and State of Wyoming requirements.

A mobile completion rig similar to the drill rig may be transported to the well site and used to complete each well. Completion operations are expected to average two to five days per well. When the applicable permits are received, natural gas may be vented or flared, and water may be temporarily contained in the reserve pit (for up to 90 days) or trucked to an alternative disposal site during the testing period. Wells determined to be productive would be shut-in until pipelines and other production facilities are constructed, if necessary.

The injection wells would be drilled with the same equipment and personnel used for the gas wells. The depth of the injection wells, which would be completed for the Haystack Mountain Formation, is expected to be between 3,000 feet and 5,000 feet. Recompletion of the four existing wellbores and the drilling and completing of a single injection well would require approximately seven to 14 days at each location; installing surface equipment, holding tanks, and pumping equipment may require an additional 14 days. The single new injection well would be drilled on an existing location next to an existing wellbore. This would result in 0.25 acre of additional short-term disturbance. It is anticipated that no additional long-term disturbance (unreclaimed disturbance) would result from operations associated with the recompletion or drilling of injection wells.

2.1.5 Production Operations

Wells in the BCII PA are expected to produce 800,000 cubic feet of gas per day (CFD) and between 400 barrels to 3,000 barrels of water per well each day. The gas would be transported from the well by a pipeline to the proposed compressor station. The water would be stored on-site in a storage tank then disposed of via flowlines to the proposed injection well. All produced water would be managed per Onshore Order No. 7.

2.1.5.1 Well Production Facilities

Wellhead facilities would be installed if the wells are productive. Natural gas and produced water would be collected and transported from the wellhead via buried pipelines. Gas and water would be measured as specified in the MSUP. Additionally, a vertical separator at some well sites would separate gas from the water stream.

The long-term surface disturbance at the location of each productive well (after areas unnecessary for production operations are reclaimed) would encompass 0.25 acre, including cut and fill slopes. Typically, only the production facilities at the well site would be fenced or otherwise removed from existing uses. A loop road or a small gravel pad area would provide a safe turnaround area for vehicles. **Figure 2-2** shows a typical CBNG well and pad before reclamation is complete.

**Figure 2-2
CBNG Well and Pad**



2.1.5.2 Power Generation

Electricity would be used to power pumps during well development and to initiate and maintain production. An electrical generator located at the proposed compressor station would be utilized to provide electricity to the wells. The distribution system would consist of utility lines buried in the road ROW. These lines would be installed in trenches approximately three feet deep.

2.1.5.3 Summary of Pipelines and Related Facilities

Construction and installation of the gas delivery pipelines would occur before the productivity of the wells has been confirmed. Pipeline corridors would be reclaimed as soon as practical after construction of the pipeline is complete. Two types of pipelines would be constructed as part of the proposed project:

1. A gas-gathering pipeline system (low pressure) would be constructed from the wellheads to the compressor station. This system would use high-density polyethylene (HDPE) pipe, starting with a four-inch diameter pipe at the wellhead and graduating to a 20-inch diameter pipe at the inlet to the compressor.
2. A produced water-gathering pipeline system (low pressure) would be constructed from the wellheads to the centralized facilities for injection. This system would use HDPE pipe, starting with a four-inch diameter pipe at the wellhead and graduating to a 20-inch diameter pipe at the injection well.

Gathering Systems and Utilities

The proposed gathering systems and utility lines would be located parallel and adjacent to access roads in separate trenches along either side of the road ROW. A working space for installation of these facilities would also be designated within the road ROW.

Trenches would be excavated to install the pipelines and electrical lines. Trenching would occur as close to the road ROW as feasible. Trenches excavated for well gathering lines and electrical

lines (which would require a disturbed width of 20 feet for gas and water lines on one side of the road and a disturbed width of 10 feet for electrical lines on the other side of the road, yielding a total short-term disturbance width of 80 feet, when adjacent and parallel to proposed access roads) would be reclaimed as soon as practical after trenching and backfilling are complete. The new gathering lines and utilities would temporarily disturb 24.4 acres and these disturbances would be reclaimed to BLM specifications.

To minimize surface disturbance, the Operator would use wheel trenchers (ditchers) or ditch witches, where possible, to construct all pipeline trenches associated with this project. Track hoes or other equipment would be used where topographic or other factors require their use. Trenches greater than 0.25 mile in length that are open for the installation of pipelines would have plugs placed to allow livestock and wildlife to cross the trench. Placement of plugs would be determined in consultation with the BLM.

Excavated topsoil material would be stockpiled and segregated. Topsoil would not be mixed or covered with subsurface material. After construction, cut and fill slopes would be water-barred or regraded to conform to the surrounding topography and reclaimed to pre-disturbance appearance.

Facilities for Injection

Produced water from individual wells would be gathered and routed to central storage facilities located next to injection wells. Produced water-gathering pipelines would be constructed along well access roads from the wellhead to the injection facilities.

Five deep injection wells would be approved by the WOGCC (locations are shown on **Figure 2-1**). The approximate maximum injection capacity of the five injection wells would be 15,000 barrels per day (bbls/day) per well.

Compressor Station

An additional compressor station would be constructed next to the existing compressor station located in SW NW Sec. 12, T14N-R91W. This site is a highly disturbed location and the installation of the compressor would not result in new disturbance.

The compressor station would be sized to handle five million CFD from 15 pounds per square inch (psi) suction pressure to 1,200 psi discharge pressure. A natural gas power engine would power the facility and would be designed to meet all the specifications established by the applicable WDEQ – Air Quality Division (AQD) permit. Emissions resulting from the compressor station would be less than 1.5 grams of nitrogen oxide (NO_x) per brake horsepower per hour (g/bhp-hr), resulting in less than 16.7 tons per year of NO_x as well as less than 0.5 g/bhp-hr of carbon monoxide (CO), resulting in less than 5.6 tons per year of CO. **Figure 2-3** shows a typical CBNG compressor station.

Figure 2-3
CBNG Compressor Station



2.1.6 Maintenance

The Proponents would operate all wells, pipelines, and ancillary production facilities in a safe manner, as set forth by standard industry operating guidelines and procedures. Routine maintenance of producing wells would be necessary to maximize performance and to detect potential difficulties with gas production operations. Each well location would be visited several times per week to ensure that operations are proceeding in an efficient and safe manner. The visits would include checking separators, water meters, valves, fittings, and on-site storage of produced water and condensates. The on-site equipment also would be routinely maintained, as necessary. Additionally, all roads and well locations would be regularly inspected and maintained to minimize erosion and assure safe operating conditions.

2.1.7 Estimates of Traffic and Work Force

Estimated traffic requirements for drilling, completion, and field development operations are shown on **Table 2-2**. The “Trip Type” column lists the various service and supply vehicles that would travel to and from the well sites and production facilities. The “Round-Trip Frequency” column lists the number of trips, both external (to and from the BCII PA) and internal (within the BCII PA). The figures provided on **Table 2-2** should be considered general estimates. The level of drilling and production activity may vary over time in response to weather and other factors.

**Table 2-2
Traffic Estimates**

Trip Type	Round-Trip Frequency	
	External (to/from BCII PA)	Internal (within BCII PA)
Rig crews	4/day	4/day
Engineers ^a	2/week	1/day/rig
Mechanics	4/week	4/week
Supply delivery ^b	1/week	2-4/day
Water truck ^c	1/month	2 round trips/day
Fuel trucks	2 round trips/well	2 round trips/well
Mud trucks ^d	1/week	2/day
Rig move ^e	8 trucks/well	8 trucks/well
Drill bit/tool delivery	1 every 2 weeks	1 every 2 weeks
Completion		
Small rig/crew	1/day	1/day
Cement crew	2 trips/well	2 trips/well
Consultant	1/day	1/day
Well loggers	3 trips/well	3 trips/well
Gathering systems	2/day	2/day
Power systems	2/day	2/day
Compressor stations	2/day	2/day
Other field development	2/day	2/day
Testing and operations	2/day	2/day

Notes:

^a Engineers travel to BCII PA weekly and stay in a mobile home at the BCII PA during the week.

^b Current plans are to establish a central supply area within the BCII PA and deliver supplies weekly.

^c Water trucks would deliver water to rigs from a location within the BCII PA.

^d Current plans are to establish a central mud location within the BCII PA and deliver mud weekly.

^e Four trucks would be required to move each rig to the BCII PA. When drilling is complete in a BCII PA, each rig would move to the next BCII PA.

2.1.8 Site Restoration and Abandonment

The Proponents would completely reclaim all disturbed areas that are not needed for production through the following procedures:

Short-Term (Interim) Reclamation

- Within one year of drilling, stabilize the disturbed area by recontouring areas unnecessary for production operations, mulching, providing run-off and erosion control, establishment of new vegetation, and weed control, as necessary.

- Reserve pit fluids would be evaporated, removed, or solidified within one year from the date drilling operations reached total depth (TD).

Long-Term (Final) Reclamation

- Recontour all disturbances to approximately the topography that existed prior to construction, and re-spread topsoil.
- Restore primary productivity of each site and establish vegetation that provides for natural plant and community succession.
- Establish a vigorous stand of desirable native plant species resistant to the invasion of noxious or undesirable species.

In the long-term, reclaimed landscapes should have characteristics that approximate the original visual qualities of the surrounding area.

Performance Standards

The following performance standards should be used to determine the attainment of successful revegetation and reclamation:

- All disturbed areas should have at least 50% of pre-disturbance vegetation cover of protective material within six months after reclamation.
- By the second year, at least 50% vegetative cover should have been established.
- By the fifth year, at least 80% of the site should be vegetated.
- The reclaimed area should be comprised of at least 20% of the species contained in the seed mix and/or present on the adjacent undisturbed areas. No single species should account for more than 50% of the total vegetative cover unless similar to the adjacent undisturbed areas. Noxious weeds will be controlled.
- Erosion condition of the reclaimed areas is equal to or in better condition than the adjacent undisturbed areas.

Visual resource management (VRM)-friendly snow fencing would be erected, where applicable, to capture snow drifting across disturbances and aid in revegetation efforts.

2.1.9 Summary of Estimated Disturbances

Table 2-3 summarizes the estimated disturbances from implementing the proposed project.

Table 2-3
Estimates of Additional Disturbance Areas – Brown Cow II Project Area

Facility	Evaluation Phase			Operations
	Length (feet)	Width (feet)	Short-Term (acres)	Long-Term (acres)
New Roads	25,902	50 ST/ 30 LT	29.7	17.8
New Gathering Lines	37,225	20	17.1	0.0
Utilities	31,901	10	7.3	0.0
New Drill Pads (12)	300	200	24.0 ^a	3.0 ^b
Injection Wells (5)	Existing Disturbance		0.0	0.0
Compressor Station	Existing Disturbance ^c		0.0	0.0
Total Disturbance			78.1	20.8

Notes:

ST = short-term

LT = long-term disturbance

^a *New drill pads are 2.0 acres each for calculating short-term disturbance*

^b *New drill pads are 0.25 acre each for calculating long-term disturbance*

^c *The site is a highly disturbed location and installation would not result in new disturbance*

2.1.10 Project-Wide Mitigation Measures and Procedures

The Proponents have voluntarily agreed to use and comply with measures and procedures to avoid or mitigate impacts to resources or other land uses. These measures and procedures will be referred to as BMPs throughout this document.

2.1.10.1 Preconstruction Planning, Design, and Compliance Measures

1. The Proponents will designate a qualified representative to serve as compliance coordinator. This person would be responsible for ensuring that all requirements of the APD and Plan of Development (POD) (e.g. MSUP, MDP, COAs, and/or Terms and Conditions) are followed.
2. New roads would be constructed and existing roads maintained in the BCII PA in accordance with the standards in BLM Manual 9113 for resource roads and construction details outlined in the MSUP and COAs.
3. Roads would be crowned with a 0.3-foot to 0.5-foot crown and ditched. The topsoil would be graded over the cut slope so no berm is left at the top of the cut slope.
4. Culverts would be covered with a minimum of 12 inches of fill or one-half the diameter of the pipe, whichever is greater. The inlet and outlet would be set flush with existing ground and aligned in the center of the draw. Before the area is backfilled, the bottom of the pipe would be bedded on stable ground that does not contain expansive or clay soils, protruding rocks that could damage the pipe, or unevenly sized material that would not form a good seat for the pipe. The area would be backfilled with unfrozen material and rocks no larger than two inches in diameter. Care would be exercised to thoroughly

compact the backfill under the culvert and would be raised evenly in six-inch layers on both sides of the culvert.

5. Additional culverts would be installed in the existing access roads as needed or as directed by the BLM.
6. Access roads would be surfaced with an appropriate grade of aggregate or gravel to a depth of four inches before the drilling equipment or rig is moved onto the pad.
7. Access roads would be maintained in a safe and usable condition. A regular maintenance program would include, but is not limited to, blading, ditching, installing or cleaning culverts, and surfacing.
8. If snow must be removed outside of access roads, snow removal equipment would be equipped with shoes to raise the blade off the ground surface. Special precautions would be taken on uneven ground to prevent the equipment from destroying vegetation.
9. Wing ditches would be constructed, as necessary, to divert water from roadside ditches.

2.1.10.2 Resource-Specific Requirements

The Proponents propose to implement the following resource-specific mitigation measures, procedures, and BLM management requirements on public lands.

Geology, Minerals, and Paleontology

Mitigation measures presented in the sections of this EA pertaining to soil and water resources would avoid or minimize potential impacts to surface mineral resources. The BLM and WOGCC policies on casing and cementing would protect subsurface mineral resources from adverse impacts.

Scientifically valuable paleontological resources that may occur in the BCII PA would be protected through the following mitigation measures:

1. Project personnel will make contingency plans for the accidental discovery of scientifically valuable fossils. If construction personnel discover fossils during implementation of the proposed project, the BLM will be notified immediately. If the fossils could be adversely affected, construction would be redirected until a qualified paleontologist has assessed the importance of the uncovered fossils and the extent of the fossiliferous deposits and has implemented recommendations for further mitigation.
2. No specific data currently exists on deposits of high or undetermined paleontologic potential in BCII PA. For that reason, field surveys for paleontologic resources will be conducted on a case-by-case basis. These resources would be surveyed in areas where surface exposures of the Browns Park, Green River, or Wasatch Formations occur. Field surveys may result in identification of additional mitigation measures to reduce adverse impacts to fossil resources. This mitigation may include collection of additional data or representative samples of fossil material, monitoring excavation, or avoidance. In some cases, no action beyond measures taken during the field surveys may be necessary.
3. A report will be submitted to the BLM after each field survey is complete. The report will describe in detail the results of the survey with a list of fossils collected, if any, and may recommend additional mitigation measures. If scientifically valuable fossils are

collected, the report must document the curation of specimens into the collection of an acceptable museum repository and must contain appropriate geologic records for the specimens.

Air Quality

1. All activities conducted or authorized by the BLM must comply with applicable local, State, Tribal, and Federal air quality regulations and standards. The Proponents will adhere to all applicable ambient air quality standards, permit requirements (including preconstruction, testing, and operating permits), standards for motorized equipment, and other regulations, as required by the State of Wyoming, WDEQ, and AQD.
2. The Proponents would not allow garbage or refuse to be burned at well locations or other facilities. Before any wells are vented or flared, WDEQ-AQD would be notified, as required by Wyoming Air Quality Standards and Regulations, Chapter 1, Section 5 Reporting Guidelines for Well Flaring and Venting. Test periods longer than 15 days will require authorization by WOGCC, in accordance with Chapter 3, Section 40 Authorization for Flaring and Venting of Gas.
3. On Federal land, the Proponents would immediately abate fugitive dust by application of water, chemical dust suppressants, or other measures when air quality is impaired, soil is lost, or safety concerns are identified by the BLM or the WDEQ-AQD. These concerns include, but are not limited to, actions that exceed applicable air quality standards. The BLM will approve the control measure, location, and application rates. If watering is the approved control measure, the Operator must obtain the water from State-approved sources.

Soil and Water Resources

1. The Proponents will avoid using frozen or saturated soils as construction material.
2. The Proponents will selectively strip and salvage topsoil from all disturbed areas. Topsoil will be removed and conserved to a minimum depth of six inches and a maximum depth of 12 inches from all disturbances, unless otherwise agreed to by the BLM and the Operator.
3. Where possible, disturbance to vegetated cuts and fills will be minimized on existing improved roads.
4. Drainage crossings will be designed to carry the 25-year discharge event, or as otherwise directed by the BLM.
5. The Proponents will erect snow fencing or other suitable structures for the capture of snow on specified locations and for the minimization of wind scouring on erosive sites.
6. The Proponents will maintain a 100-foot wide buffer of natural vegetation (not including wetland vegetation) between construction and ephemeral and intermittent stream channels.

The Proponents will include adequate drainage control devices and measures in the design of roads (e.g. berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipaters). These devices and measures would be located at sufficient intervals and intensities to adequately control and direct surface runoff above,

below, and within the road to avoid erosive, concentrated flows. In conjunction with surface runoff or drainage control measures, the Proponents would use erosion control devices and measures such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. In addition, the Proponents would implement a revegetation program as soon as possible to reestablish the soil protection afforded by vegetation.

When construction that is not specifically required for production operations is complete, the Proponents will restore topography to near pre-existing contours at the well sites, along access roads and pipelines, and at other facilities. The Proponents also will replace up to six inches of topsoil or suitable plant growth material over all disturbed surfaces.

7. To minimize the cumulative effects of the BCII POD in combination with the existing Browning Field developments, the Operator shall prepare a plan for the clean-up and removal (where possible) of existing and/or discarded equipment and facilities associated with the Browning Field. The plan shall include the painting of the remaining above-ground facilities to an appropriate color, remediation of several small oil and other substance releases, and revegetation of the existing disturbances. The plan shall be submitted by Sundry Notice to the BLM, and shall include a timeline for completion. Upon BLM approval of the plan, the Operator shall implement the plan and provide notification to the BLM upon completion.
8. The Proponents will limit construction of all drainage crossings to no-flow or low-flow periods.
9. The area of disturbance would be minimized within ephemeral, intermittent, and perennial stream channels.
10. The Proponents will design channel crossings to minimize changes in channel geometry and subsequent alterations in flow hydraulics.
11. Interceptor ditches, sediment traps, water bars, silt fences, and other revegetation and soil stabilization measures would be designed and constructed, as needed.
12. The Proponents will construct channel crossings by pipelines such that the pipe is buried a minimum of four feet below the channel bottom.
13. Disturbed stream beds would be regraded to the original geometric configuration and would contain the same or similar bed material.
14. Wells must be cased during drilling and all wells cased and cemented in accordance with Onshore Order No. 2 to protect all high-quality aquifers. High-quality aquifers exhibit known water quality of 10,000 milligrams per liter (mg/L) total dissolved solids (TDS) or less. Well casing and cementing must be of adequate integrity to contain all fluids under high pressure during drilling and well completion. Furthermore, wells will adhere to the appropriate BLM cementing policy.
15. The reserve pits would be constructed in cut rather than fill materials. Fill material must be compacted and stabilized, as needed. The subsoil material of the pit to be constructed should be inspected to assess stability and permeability and to evaluate whether reinforcement or lining is required. If lining is required, the reserve pit must be lined with a reinforced synthetic liner at least 12 mils thick and with a bursting strength of 175 by 175 pounds per inch (American Society for Testing and Materials [ASTM] Standard

D 75179). Use of closed or semi-closed drilling systems should be considered in situations where a liner may be required.

16. Two feet of freeboard must be maintained on all reserve pits to ensure they are not in danger of overflowing. Drilling operations must cease if leakage is found outside of the pit and remain so until the problem is corrected.
17. Hydrostatic test water used in conjunction with pipeline testing and all water used during construction must be extracted from sources that contain sufficient water quantities and with appropriation permits approved by the State of Wyoming.
18. The Proponents will develop and implement a pollution prevention plan (PPP) for storm water runoff at drill sites as required by WDEQ permit requirements.
19. The Proponents will exercise stringent precautions against pipeline breaks and other potential accidental discharges of oil or hazardous chemicals into adjacent streams. If liquid petroleum products are stored on-site in sufficient quantities (per the criteria contained in Title 40 Code of Federal Regulations [CFR] Part 112, dated December 1973 and updated in July 2002), a Spill Prevention Control and Countermeasures (SPCC) plan will be developed.
20. The Proponents will coordinate all crossings or encroachments of waters of the U.S. with the U.S. Army Corps of Engineers (USACE).
21. The BLM must approve, in writing, any changes in the method or location for disposal of produced water.

Vegetation, Wetlands, and Noxious/Invasive Weeds

1. An approved Pesticide Use Proposal would be obtained before pesticides are applied to control weeds on BLM surface ownership lands.
2. Disturbed areas would be seeded and stabilized in accordance with BLM-approved reclamation guidelines.
3. The Operator shall initiate a weed monitoring and control effort upon authorization. The Operator shall, at least annually, provide a report to the BLM with (1) a map of the well locations, facilities, and road segments reviewed; (2) a map of any identified weed populations, labeled by species; and (3) a plan for treatment and control (including documentation of previous control efforts).
4. Initiate interim reclamation (e.g. pit evaporation/fluid removal/pit solidification, recontouring, ripping, spreading topsoil, seeding, and weed control) for areas unnecessary for production operations as soon as possible after drilling operations are completed, but within no more than one year from the date TD is reached.

Range Resources and Other Land Uses

1. The Proponents will coordinate with the affected livestock operators to ensure that livestock control structures remain functional (as directed by the livestock operator) during drilling and production operations, and to coordinate timing of activities.
2. Traffic control and speed limits would be used to limit potential conflicts between operators and livestock.

Wildlife and Fisheries

1. During reclamation, the Proponents would establish a variety of forage species that would return the land to a condition that approximates its state before disturbance. In the short-term, grasses would be established and, in the long-term, shrub and forb species would naturally establish.
2. The Proponents will prohibit unnecessary off-site activities of operational personnel near the drill sites. The Proponents also will inform all project employees of applicable wildlife laws and penalties associated with unlawful take and harassment.
3. Construction will not be allowed during critical nesting season (February 1-July 31) near active raptor nests. Seasonal timing restrictions within a “buffer zone” around nests to avoid disturbance to nesting raptors would reduce the impact from construction activities. In addition, well locations, roads, ancillary facilities, and other surface structures requiring a repeated human presence would not be constructed within 825 feet of raptor nests, except ferruginous hawks, where the restriction would be 1,200 feet (restriction generally excludes surface disturbance). Exception requests may be granted if nests are found to be inactive, or modified if there is visual screening of the nest that is determined by the BLM to be sufficient to minimize impacts.
4. Surface disturbing activities will not be allowed within 0.25 mile of the perimeter of identified active or occupied greater sage-grouse leks. Human activity would be avoided between 6:00 p.m. and 9:00 a.m. from March 1 to May 20 within 0.25 mile of the perimeter of occupied leks; surface disturbance and other actions that create permanent and high-profile structures such as buildings, storage tanks, and overhead power lines will not be constructed within 0.25 mile of the perimeter of leks, as determined on a case-by-case basis. Surface disturbing and disruptive activities will not be allowed between November 15 and March 14 in delineated winter concentration areas and, to minimize noise disturbances to strutting or dancing grouse, the Proponents would locate compressor stations and generators appropriately so that noise at any nearby greater sage-grouse or sharp-tailed grouse display grounds does not exceed 49 decibels on the A-weighted scale (dBA) (10 dBA above background noise). Other techniques and/or equipment can be utilized when it is demonstrated that they result in similar or increased noise reduction. Additional noise reduction techniques may be required if research shows that current techniques are not adequate.
5. The Proponents will protect greater sage-grouse nesting habitat during the breeding, egg-laying, incubation, and early brood-rearing period (March 1-July 15) by restricting construction within a two-mile radius of active leks for greater sage-grouse. Exceptions may be granted if the activity will not interfere with greater sage-grouse nesting activity.
6. All prairie dog colonies on the BCII EA would be avoided, where practical. If prairie dog colonies of sufficient size and burrow density to accommodate black-footed ferrets are scheduled to be disturbed, as identified in annual reports, then black-footed ferret surveys of the colonies would be conducted pursuant to BLM and/or US Fish and Wildlife Service (USFWS) decisions made during informal consultations. Survey protocol would adhere to USFWS guidelines and would be conducted by a USFWS-qualified biologist a maximum of one year in advance of the proposed disturbance. Reports identifying survey methods and results will be prepared and submitted to the USFWS and the BLM in accordance with Section 7 of the Endangered Species Act of

1973, as amended (ESA) and the Interagency Cooperation Regulations. Surveys will be financed by the Operators. If black-footed ferrets are found on the BCII PA, the USFWS would be notified immediately and formal consultation would be initiated to develop strategies that ensure no adverse effect to the species would occur. Before ground-disturbing activities are initiated in black-footed ferret habitat, authorization to proceed must be received from the BLM, in consultation with the USFWS.

7. Construction activities in potential mountain plover nesting habitat during the nesting period (April 10-July 10) would not be allowed unless an exception is granted. An exception may be granted if a survey for mountain plovers is conducted and none are found within areas of potential habitat prior to any surface disturbance in those areas, according to current mountain plover survey protocol (USDI-FWS 2002).
8. All pits and open cellars must be fenced for the protection of wildlife and livestock and fencing must be in accordance with BLM specifications. Netting must be placed over all production pits to eliminate any hazard to migratory birds or other wildlife. Netting is also required over reserve pits that have been identified as containing oil or hazardous substances (per the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 101 (14)), as determined by visual observation or testing. The mesh diameter will be no larger than one inch.
9. No construction activities or prolonged maintenance actions would be conducted within big game crucial winter range during the crucial winter period of November 15-April 30.

Recreation

1. The Proponents must minimize conflicts between project vehicles/equipment and recreation traffic by posting warning signs, implementing operator safety training, and requiring project vehicles to adhere to low speed limits.

Visual Resources

1. The Proponents must use existing topography to screen from view the proposed access roads, pipeline/utility corridors, wellheads, and production facilities as well as drill rigs.
2. The Proponents must paint structures, wells, and facilities with flat colors (such as Carlsbad Canyon or Shale Green) that blend with the adjacent undisturbed terrain and would be a color specified by the BLM. This measure does not apply to structures that require safety coloration in accordance with the requirements of the Occupational Safety and Health Administration (OSHA).

Cultural Resources

1. Avoidance is the preferred method for mitigating adverse effects to a property that is considered eligible for listing, or is already listed in, the National Register of Historic Places (NRHP).
2. Adverse effects to cultural or historical properties that cannot be avoided would be mitigated by implementing a cultural resources mitigation plan (including a data recovery plan).

3. If cultural resources are discovered at any time during construction, all construction would cease and the BLM would be immediately notified. Work would not resume until the BLM issues a Notice to Proceed.
4. A BLM-permitted archaeologist will monitor all well pad, access road, and pipeline corridor construction activities and conduct an open-trench inspection of the pipeline in areas that have a high potential for intact, buried cultural deposits or near known buried cultural resources.
5. All above-ground facilities will be painted a color compatible with the local environment to minimize visual intrusions to the historic setting of the Cherokee Trail.
6. Access roads will be surfaced with materials that are compatible with the local environmental colors to minimize visual intrusions to the historic setting of the Cherokee Trail.

Socioeconomics

1. Project activities must be coordinated with ranching operations to minimize conflicts that involve movement of livestock or other ranch operations. Coordination would include scheduling project activities to minimize potential disturbance of large-scale livestock movements. The Proponents would establish effective and frequent communication with affected ranchers to monitor and correct problems and coordinate scheduling.
2. The Proponents and their subcontractors would obtain Carbon County sales and use tax licenses for purchases made in conjunction with the proposed project so that project-related sales and use tax revenues will be distributed to Carbon County.

Transportation

1. Roads that are not required for routine operation and maintenance of producing wells and ancillary facilities would be permanently blocked, reclaimed, and revegetated.
2. Permits are required from Carbon County for any access to or across a County Road or for any pipeline that crosses a County Road. These permits would be acquired before additional roads are built. All roads on public lands that are not required for operation and maintenance of field production would be permanently blocked, re-contoured, and seeded. Roads on private lands would be treated in a similar manner, depending on the desires of the landowner.
3. The Proponents will be responsible for preventive and corrective maintenance of roads in the BCII PA throughout the duration of the project. Maintenance may include blading, cleaning ditches and drainage facilities, abating dust, controlling weeds, or other requirements as directed by the BLM or the Carbon County Road and Bridge Department.
4. Except in emergencies, access to the BCII PA would be limited to drier conditions to prevent severe rutting of road surfaces. Culverts would be installed where needed to allow drainage in all draws and areas of natural drainage. Low water crossings will be used where applicable. On-site reviews will be conducted with BLM personnel for approval of proposed access before any construction begins.

Health and Safety

1. Sanitation facilities installed on the drill sites and any resident camps will be approved by the WDEQ.
2. To minimize undue exposure to hazardous situations, the Proponents will comply with all applicable rules and regulations (such as Onshore Orders and OSHA requirements) that would prevent the public from entering hazardous areas and the Proponents will post warning signs to alert the public of truck traffic.
3. The Proponents will haul all garbage from the drill sites to a State-approved sanitary landfill for disposal. In addition, the Proponents will collect and store any garbage or refuse on-site until it can be transported in containers approved by the BLM.

Hazardous Materials

1. SPCC plans will be written and implemented, as necessary, in accordance with 40 CFR Part 112 to prevent discharge into navigable waters of the United States.
2. If quantities that exceed 10,000 pounds or the threshold planning quantity (TPQ), as designated by the RFO, are to be produced or stored in association with the proposed project, chemical and hazardous materials would be inventoried and reported in accordance with the toxic release inventory (TRI) requirements set forth in Title III of the Superfund Amendments and Reauthorization Act (SARA) and codified at 40 CFR Part 335. The required Section 311 and 312 forms would be submitted at the specified times to the State and County emergency management coordinators as well as to local fire departments.
3. Any hazardous wastes, as defined by the Resource Conservation and Recovery Act (RCRA), would be transported and disposed of in accordance with all applicable Federal, State, and local regulations.
4. All production facilities installed on-site that have the potential to leak or spill oil, glycol, produced water, or other fluids that may constitute a hazard to public health or safety shall be placed within an appropriate containment or diversionary structure sufficient to hold at least 110% of the largest container within the facility. The structure shall be impervious to any oil, glycol, produced water, or other hazardous fluid for 72 hours. In addition, the structure will be constructed so that any discharge from a primary containment system will not drain to, infiltrate, or otherwise escape to groundwater, surface water, or navigable waters before cleanup is completed.
5. The Operator shall maintain a hazardous materials/oil and gas release contingency response plan that applies to the proposed project, and shall provide the BLM with a copy of the current plan and any subsequent changes made to the plan.

Noise

1. The Proponents will muffle and maintain all motorized equipment according to manufacturer's specifications.
2. The BLM will require that noise levels be limited to no more than 10 dBA above background levels, as measured at greater sage-grouse leks. The BLM will require that compressor engines located on public lands be enclosed in a building and located at least

600 feet away from sensitive receptors or sensitive resource areas to comply with this limit on noise levels.

2.2 ALTERNATIVE 2 – NO-ACTION ALTERNATIVE

Section 1502.14(d) of NEPA requires that the alternatives analysis “include the alternative of no action.” “No Action” implies that ongoing natural gas production activities, if any exist, would be allowed to continue by the BLM in the BCII PA, but the proposed project would not be allowed. The BCII PA has been disturbed by existing conventional and CBNG drilling. The BLM will consider additional APDs and ROW actions for Federal land on a case-by-case basis consistent with the scope of existing environmental analysis. Additional gas development could occur on State and private lands within the BCII PA under APDs approved by the WOGCC.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The proposed project was developed considering measures provided in the ARPA Interim Drilling Policy – Development Authorized Concurrent with EIS Preparation for the Atlantic Rim CBNG Project.

Wells and ancillary facilities were reviewed during the alternatives analysis to determine the best feasible locations to meet the stated purpose and need. Ten of the 12 production well locations and their associated access roads were moved during a field review. The wells were moved to new pad sites that would result in less impact to soil, vegetation, water, and wildlife resources. The following wells and associated road alignments were moved from the locations originally considered based on impacts to resources:

1. Well 1491 1-11 – Well pad and access road moved to eliminate large cuts/fills and co-locate well with existing disturbance.
2. Well 1491 7-14 – Well pad and access road moved to eliminate steep road grade. Access road junction with existing road moved and re-aligned at 90-degree angle to eliminate two junctions.
3. Well 1491 11-2 – Well pad moved to reduce cuts/fills.
4. Well 1491 9-14 – Well pad and access road moved to avoid steep road grade.
5. Well 1491 3-14 – Access road moved to minimize surface disturbance.
6. Well 1491 11-11 – Access road moved to reduce disturbance to serviceberry brush plant community.
7. Well 1491 3-11 – Well pad moved to avoid large cuts/fills.
8. Well 1491 15-2 – Well pad moved and rotated to avoid disturbance of rocky slope.
9. Well 1491 15-11 – Well pad and access road moved to avoid steep road grade and spring outcrop.
10. Well 1491 9-11 – Well pad and access road moved to avoid steep road grade and large cuts/fills.

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3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter is a summary of the affected environment for all resources potentially impacted by the Proposed Action. These resources are addressed based on management issues identified by the BLM, Great Divide RMP, public scoping, and by interdisciplinary desktop and field analyses of the BCII PA.

The Proposed Action is located in the ARPA, adjacent to the existing Brown Cow I POD, which has 12 existing wells and associated infrastructure (i.e. access roads, flowlines, produced water lines, water injection wells, and compressor station). The Proposed Action has the potential to affect the critical elements of the human environment, as listed in the BLM NEPA Handbook H-1790-1 (BLM 1988). Critical elements of the human environment, their status in the BCII PA, and their potential to be affected by the Proposed Action are identified in **Table 3-1**. Items listed as “None Present” are not addressed in this EA because they would not be affected by either the Proposed Action or the No-Action Alternative.

Table 3-1
Elements of the Human Environment, Brown Cow II Project,
Carbon County, Wyoming 2006

Element	Status in BCII PA	Addressed in EA
Geology/Minerals/Paleontology	Potentially Affected	Yes
Climate and Air Quality	Potentially Affected	Yes
Cultural Resources	Potentially Affected	Yes
Water Resources (surface and groundwater)	Potentially Affected	Yes
Wildlife/Fisheries (Federal threatened/endangered and sensitive species)	Potentially Affected	Yes
Range Resources/Land Use	Potentially Affected	Yes
Vegetation (including wetlands/riparian and noxious weeds)	Potentially Affected	Yes
Recreation	Potentially Affected	Yes
Visual Resources	Potentially Affected	Yes
Socioeconomics	Potentially Affected	Yes
Transportation	Potentially Affected	Yes
Native American Religious Concerns	Potentially Affected	Yes
Noise	Potentially Affected	Yes
Hazardous or Solid Waste	Potentially Affected	Yes
Soils	Potentially Affected	Yes
Health and Safety	Potentially Affected	Yes
Floodplains	None Present	No
Wild and Scenic Rivers	None Present	No

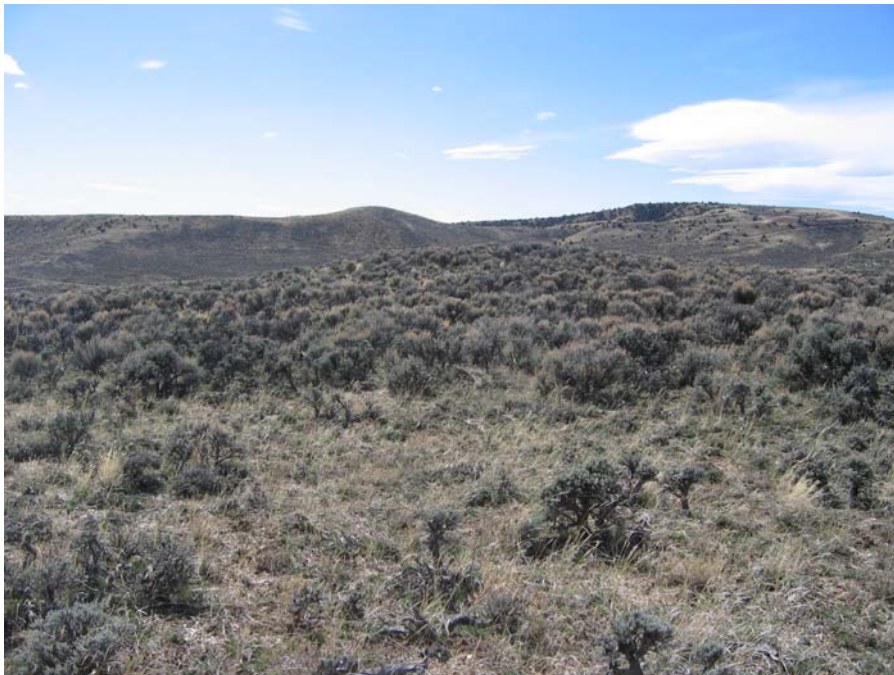
Element	Status in BCII PA	Addressed in EA
Wilderness	None Present	No
Environmental Justice	None Present	No
Areas of Critical and Environmental Concern	None Present	No
Prime and Unique Farmland	None Present	No

3.2 GEOLOGY, MINERALS, AND TOPOGRAPHY

3.2.1 Physiography, Topography, and Landforms

The BCII PA is located within the southeastern arm of the Washakie Basin, which is a sub-basin of the Greater Green River Basin in south-central Wyoming. Elevations in the BCII PA range from 6,600 feet to 7,200 feet. The majority of the terrain in the BCII PA is gently rolling hills, as seen in **Figure 3-1**; however, areas of steep terrain also occur within the BCII PA. This terrain generally supports the sagebrush species found throughout the BCII PA; however, Utah juniper (*Juniperus osteosperma*) can also be observed on the steeper hillsides. Washakie Basin is bordered on the east by the Sierra Madre Range, on the north by the Wamsutter Arch, and on the south by the Cherokee Ridge. The BCII PA is located west of the Mesaverde Group outcrop belt and east of the monocline forming most of the structural relief at the eastern margin of Washakie Basin.

Figure 3-1
Representative view of topography in the BCII PA



3.2.2 Geology

During the late Cretaceous and early Tertiary Periods, eroding sediments from the surrounding highlands and mountains filled the Greater Green River Basin as it began to develop approximately 70 million years ago. It was during the late Cretaceous Period that the basin was beneath a relatively shallow epicontinental sea that extended from the Atlantic Ocean to the Gulf of Mexico. Four major transgressive-regressive cycles of this epicontinental sea have been recorded from the middle Albian to the middle Maestrichian Periods. By the middle of the early Maestrichian Period the sea had retreated from south-central Wyoming.

The BCII PA is characterized at the surface by sedimentary deposits of Quaternary and Late Cretaceous age. Surface deposits are underlain by Phanerozoic-age sedimentary rocks of Cretaceous to Cambrian age, which are underlain by Precambrian metamorphic bedrock. The Precambrian metamorphic bedrock is more than two billion years in age.

BCII PA CBNG Producing Formations

Proposed BCII PA drilling intends to target and produce natural gas from coal, carbonaceous shale, and sandstone of the Mesaverde Group in the Almond, Pine Ridge, and Allen Ridge Formations. Interbedded coal, sandstone, and carbonaceous shale within the Haystack Mountain Formation may also be targeted in the BCII PA.

The Almond Formation contains three to nine individual coal beds interbedded with carbonaceous shale and sandstone. These coal beds have good lateral continuity. The average net coal thickness ranges from four feet to 10 feet and, locally, reaches thicknesses greater than 15 feet. Individual sandstone beds may vary in thickness and appear to be laterally continuous. Porosity within these sandstones ranges from 4% to 20%.

The Pine Ridge Formation contains six to 12 individual coal beds. The average net coal thickness ranges from 10 feet to 25 feet and, locally, reaches thicknesses greater than 40 feet. Pine Ridge sandstone beds vary in thickness from two feet to 10 feet and show poor lateral continuity. Porosity within these sandstones varies from 5% to 20%.

The Allen Ridge Formation contains one to 10 individual coal beds. The average net coal thickness ranges from one foot to four feet. These coals, unlike those in the Almond and Pine Ridge Formations, are more localized and are less laterally continuous. Allen Ridge sandstones within the coal, carbonaceous shale, and sandstone interval vary from two feet to 14 feet. Porosity within these sandstones ranges from 6% to 20%.

Burial Depth of Potential Target Formations

Overburden mapping on top of the Almond Formation (the top of the Mesaverde Group) shows the drilling depths to this formation in the BCII PA vary between 700 feet in the eastern portion of the area to about 1,500 feet in the southwestern portion of the area.

The primary producing coals in the Pine Ridge Formation occur between 250 feet to 300 feet below the top of the Almond Formation. Drilling depths in this formation range from 950 feet in the eastern portion of the area to approximately 1,750 feet in the southwestern portion of the area.

Stratigraphy of Mesaverde Formations in the BCII PA

The regional stratigraphy, as applied to the BCII PA, is established through correlation of wireline logs from the Browning Federal 4-12 well with the cross-sections of Roehler and Hansen (1989). **Table 3-2** shows the depths of important Mesaverde Group stratigraphic markers as they occur in the Browning Federal 4-12 well.

Table 3-2
Measured Depth of Important Stratigraphic Units in the Browning Federal 4-12 Well

Stratigraphic Unit	Measured Depth
Almond Formation	757 feet
Pine Ridge Formation	1,005 feet
Allen Ridge Formation	1,301 feet
Haystack Mountain Formation	2,745 feet
Hatfield Sandstone	2,992 feet
Cherokee Creek Sandstone	3,310 feet
Deep Creek Sandstone	3,493 feet
Base of the Mesaverde Group	3,767 feet

Source: Dewey 2005.

3.2.3 Mineral Resources

The Washakie Basin has produced substantial quantities of oil and natural gas for several decades. Oil and natural gas production is primarily from Cretaceous-age reservoirs, including the Mesaverde Group, Steele Shale, Niobrara Shale, Frontier Formation, Muddy Sandstone, and the Cloverly Formation. Mineral development in the BCII PA has been limited to natural gas and oil. At present, six groups of CBNG wells have been authorized within the ARPA.

3.2.4 Geologic Hazards

Geologic hazards primarily include earthquakes and mass movement of earth materials. Mass movements represent the greatest geologic hazard threat within the BCII PA. Mass movements include landslides, slumping, creep, and earth flowage and these hazards are typically associated with steep slopes and topography. Topography within the BCII PA is characterized as “hilly,” punctuated by areas of 10% to 40% slopes. These steeper slopes represent an increased potential for mass movements.

Lewis and Lance Formations contain shale beds that are prone to mass movement when saturated. Lewis Shale is more susceptible to mass movement due to large areas of exposed and eroding shale. These formations are most susceptible to mass movement along the western side of their exposure where removal or erosion weakens them. Mass movements have been documented on steep slopes along Wild Horse Butte in the Lewis and Lance Formations (BLM 2003).

3.2.5 Paleontologic Resources

Fossils are known to occur in the Lance and Wasatch Formations, which occur primarily on the western and southern slopes and on top of Wild Horse Butte. These areas are minimal, spatially, and do not represent extensive outcrops of fossil-bearing formations. Additionally, Lewis Shale is known to contain invertebrate fossils and a “few” important vertebrate fossils. Lewis Shale is the most widely exposed geologic unit in the BCII PA (BLM 2003); however, no fossils have ever been recorded from the BCII PA.

3.3 CLIMATE AND AIR QUALITY

3.3.1 Climate

The BCII PA is located in an arid to semiarid climate. Weather conditions usually consist of dry, windy conditions with limited precipitation. Meteorological data for the BCII PA was collected at Baggs, Wyoming. Elevation and topography throughout the region create variations in temperature and precipitation patterns and, generally, the higher elevations experience colder temperatures and greater precipitation.

The average annual precipitation (from 1960 to 2006) at the BLM’s Little Robber rain gauge, located approximately four miles west of the BCII PA, is 9.5 inches, with rainfall and snowfall contributing equally to the total. On average, 38.8 inches of snow falls per year, with December and January being the snowiest months.

The coldest average daily temperature during the winter occurs in January with a low of 5° F and a high of 33° F. In contrast, the warmest daily temperatures during the summer occur in July with a low of 48° F and a high of 86° F. The number of frost-free days varies with elevation, but normally occurs from May to September in the BCII PA.

3.3.2 Air Quality

The National Ambient Air Quality Standards (NAAQS) and Wyoming Ambient Air Quality Standards (WAAQS) set the upper limits for concentrations of specific criteria air pollutants. These pollutants include CO, nitrogen dioxide (NO₂), ozone (O₃), particulate matter less than 10 microns in size and less than 2.5 microns in size (PM₁₀ and PM_{2.5}, respectively), sulfur dioxide (SO₂), and lead (Pb).

Under the Prevention of Significant Deterioration program (PSD), the permitting agency must determine if a new or modified emission source would have an adverse impact on air quality values, including visibility. Emissions sources in the BCII PA are limited, but are increasing with the development of natural gas exploration facilities. The atmospheric conditions in the BCII PA result in excellent dispersion of pollutants. Limited emission sources and weather conditions that result in good dispersion have allowed background levels of criteria pollutants to remain well below the NAAQS, WAAQS, and the Colorado Ambient Air Quality Standards (CAAQS). Colorado standards are considered in this analysis due to the potential dispersal of BCII emissions into their regulatory boundaries.

Table 3-3 shows the regional background concentrations of criteria air pollutants, NAAQS, WAAQS, CAAQS, and PSD Class I and II increments against the legal baseline provided by the

WDEQ and Colorado Department of Public Health and Environment. Background pollutant concentrations provide data to compare predicted impacts with applicable air quality standards.

Comparisons to the PSD Class I and II increments are intended to evaluate an “impact threshold” and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is the responsibility of the WDEQ, with oversight from the U.S. Environmental Protection Agency (EPA).

Table 3-3
Background Concentrations and Ambient Air Quality Standards

Pollutant and Averaging Time	Background Concentration	National Ambient Air Quality Standard	Wyoming Ambient Air Quality Standards	Colorado Ambient Air Quality Standards	PSD Class I Increment	PSD Class II Increment
Carbon Monoxide (CO)¹						
CO 1-hr	3,336	40,000	40,000	40,000	None	None
CO 8-hr	1,381	10,000	10,000	10,000	None	None
Nitrogen Dioxide (NO₂)²						
NO ₂ Annual	3.4	100	100	100	2.5	25
Ozone (O₃)³						
O ₃ 1-hr	169	235	235	235	None	None
O ₃ 8-hr	147	157	157	157	None	None
Particulate Matter less than 10 microns (PM₁₀)⁴						
PM ₁₀ 24-hr	47	150	150	150	8	30
PM ₁₀ Annual	16	50	50	50	4	17
Particulate Matter less than 2.5 microns (PM_{2.5})⁴						
PM _{2.5} 24-hr	15	65	65	65	None	None
PM _{2.5} Annual	5	15	15	15	None	None
Sulfur Dioxide (SO₂)⁵						
SO ₂ 3-hr	29	1,300	1300	700	25	512
SO ₂ 24-hr	18	365	260	365	5	91
SO ₂ Annual	5	80	60	80	2	20

Notes:

¹ Background data collected by Amoco at Ryckman Creek for an 8-month period during 1978-1979, summarized in the Riley Ridge EIS (BLM 1983).

² Background data collected at Green River Basin Visibility Study Site, Green River, Wyoming, during period January-December 2001 (ARS 2002).

³ Background data collected at Green River Basin Visibility Study site, Green River, Wyoming, during period June 10, 1998 through December 31, 2001.

⁴ Background data collected by WDEQ-AQD at Emerson Building, Cheyenne, Wyoming, Year 2002. These data have been determined by WDEQ-AQD to be the most representative co-located PM₁₀ and PM_{2.5} data available.

⁵ CDPHE-APCD, 1996 – Data collected at the Craig Power Plant site and Colorado Oil Shale areas from 1980-1984.

Air Quality Related Values

In addition to ambient air quality standards and PSD increments, Air Quality Related Values (AQRVs), which include the potential air pollution effects on visibility and the acidification of surface water bodies, is a concern for sensitive PSD Class I and II areas. Strict regulatory stipulations are placed on the amount of air pollution allowed from major emitting facilities in PSD Class I areas.

Emission sources can contribute to two types of visual impairment: regional haze and plume impairment. Regional haze occurs when pollutants from multiple emission sources become mixed in the atmosphere, creating visual impairment of the landscape. Plume impairment is when a distinct layer of the atmosphere becomes visible due to the emission plume contrast to background landscape features.

Visibility is often defined in terms of atmospheric light extinction or visual range, which is the farthest distance a person can see a landscape feature. Impairment of visibility is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change and a change in visibility of 1.0 dv represents a “just noticeable change” by the average person under most circumstances. Larger dv values translate into greater visibility impairment. The U.S. Forest Service (USFS) has identified specific “Level of Acceptable Change” (LAC) values, which they use to evaluate potential air quality impacts within wilderness areas.

Continuous visibility-related background data collected as part of the Interagency Monitoring of PROtected Visual Environments (IMPROVE) program are available for four sensitive PSD Class I receptors within the study area: Bridger, Brooklyn Lake, Mt. Zirkel Wilderness, and Rocky Mountain National Park. **Table 3-4** provides 2001 baseline visibility conditions monitored at these four sites (BLM 2005). As shown in **Table 3-4**, seasonal visibility in the region is very good.

Table 3-4
Standard Visual Range Data

Site	Standard Visual Range (km)	
	Average Condition	20 th Percentile Cleanest Days
Bridger Wilderness Area	181	272
Brooklyn Lake	184	283
Mount Zirkel Wilderness Area	175	249
Rocky Mountain National Park	154	275

Acid Deposition

Acidification of surface water bodies is a concern for high altitude lakes located within USFS wilderness areas. Atmospheric acid deposition is monitored as part of the National Acid Deposition Program/National Trends Network near Pinedale, Wyoming. Although the monitored deposition values are well below those levels needed to damage vegetation, lower levels of deposition may exceed the acid neutralizing capacity (ANC) of sensitive high mountain lakes.

To determine potential acid deposition impacts, the USFS utilizes a LAC of no greater than one microequivalent/liter ($\mu\text{eq/L}$) change in ANC for sensitive water bodies with existing ANC levels less than 25 $\mu\text{eq/L}$. A limit of 10% change in ANC reduction was adopted for lakes with an existing ANC greater than 25 $\mu\text{eq/L}$. **Table 3-5** shows baseline ANC levels for selected sensitive mountain lakes in the region.

Table 3-5
Background ANC for Monitored Wilderness Lakes

Wilderness Area	Lake	10 th Percentile Lowest ANC Value
Bridger	Black Joe	67.0
Bridger	Deep	59.9
Bridger	Hobbs	69.9
Bridger	Lazy Boy	18.8
Bridger	Upper Frozen	5.0
Fitzpatrick	Ross Lake	53.5
Glacier Lakes Ecosystem Experiments Site	West Glacier Lake	35.2
Mount Zirkel	Lake Elbert	51.9
Mount Zirkel	Seven Lakes	36.2
Mount Zirkel	Summit Lake	47.3
Popo Agie	Lower Saddlebag	55.5
Rawah	Island Lake	68.7
Rawah	Kelly Lake	181.1
Rawah	Rawah #4 Lake	41.2

3.4 SOILS

There is currently no Natural Resource Conservation Service (NRCS) soil survey available for Carbon County, Wyoming. However, in 1981 Texas Resource Consultants (TRC) and Wells *et al.* were contracted to produce soils data at a third-order level of detail for the BLM and in coordination with the NRCS, known at the time as the Soil Conservation Service (SCS). These data were used to describe the soil series, associations, and complexes that occur within the BCII PA. The interpretation rating for each map unit was based upon the standards and procedures of

the SCS National Soils Handbook, the SCS Guide for Interpreting Engineering Uses of Soils, Portland Cement Association Soils Primer, and Wischmeier and Smith (1978).

According to the TRC and Wells *et al.* surveys, there are five soil associations mapped in the BCII PA: Pinelli-Forelle complex, Cushool-Rock River Association, Pinelli-Boettcher clay loam, Blazon-Shinbara-Rentsac complex, and Forelle-Diamondville loams. Refer to **Figure 3-3** for a map of soil association locations within the BCII PA.

Two PBS&J biologists conducted a field visit with three BLM representatives on April 12 and 13, 2006. The BLM representatives highlighted areas of concern on the BCI PA such as erosion on existing roads, insufficient drainage capacity at pad sites, and poor reestablishment of vegetation. The biologists then tested soils at the proposed well pads and associated access roads. Soil pits were dug and the soils assessed for their depth, texture, erosion hazard, and bearing strength. One area of concern was identified within the BCII PA; the soil pit dug at proposed well pad AR Federal 1491 7-11 revealed weathered shale soils. The proposed access road both north and south of the proposed well pad had similar soils and exhibited signs of advanced water erosion. The area, as seen on **Figure 3-2**, was labeled a water erosion hazard zone.

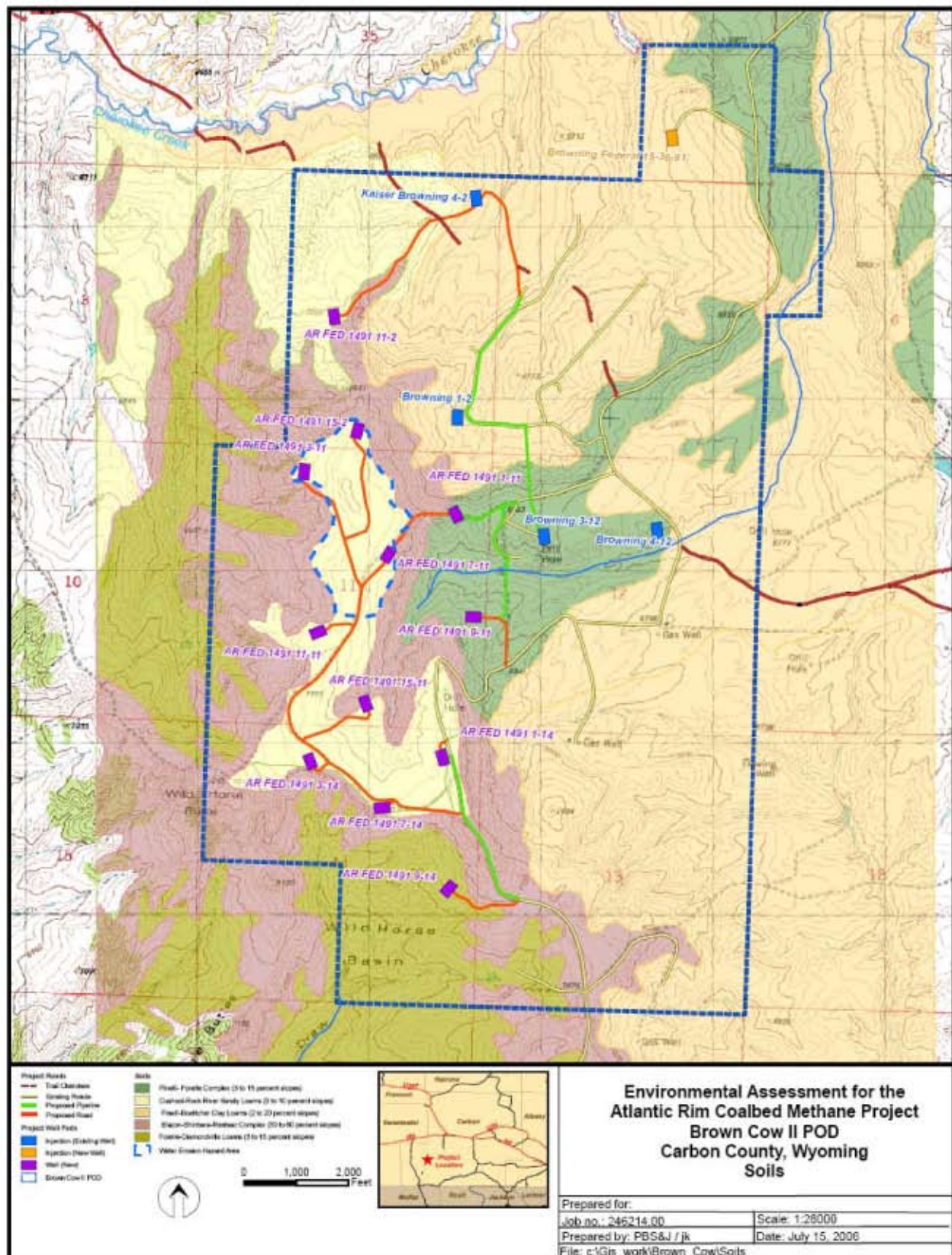
Soils within the BCII PA are generally uniform with slight variations in color and texture. A top layer, ranging from two inches to four inches in depth, was generally observed to be composed of light brown silt loam. The second layer was generally brown silt clay and soils were observed to be shallow to moderately deep. With the exception of the designated water erosion hazard zone, soils at the BCII PA have moderate wind erosion and water erosion potential; soils in the hazard zone have severe water erosion potential.

Figure 3-2
Soil Erosion Hazard



Severely eroded drainage ditch on north side of road located north of AR Federal 1491 7-11.

Figure 3-3 Soils



3.5 WATER RESOURCES

3.5.1 Groundwater

Groundwater resources include deep and shallow confined and unconfined aquifers. Site-specific data on groundwater for the BCII PA are limited. The regional flow of the groundwater in the project area is to the west. The groundwater in the vicinity of the BCII PA is located in different geological units. The Quaternary aquifers in the vicinity of the BCII PA are sandy and drain downward towards permeable formations (Collentine *et al.* 1981). The Tertiary aquifers found in the vicinity of the BCII PA flow in a west-southwest direction from the higher elevations of the Sierra Madre Uplift to the center of the Washakie Basin and the major streams in the area (Collentine *et al.* 1981). Cretaceous aquifers are composed of interbedded sandstone, shale, and coal (Collentine *et al.* 1981). Flows in the Cretaceous period formations are to the west and they are recharged by infiltration of precipitation through the Tertiary sediments. The producing coal seams in the Mesaverde Group, of the Cretaceous period formations, are classified as confined to semi-confined because they are bounded by confining layers that consist of impervious to semi-pervious layers of shale and siltstone. There is a potential for hydraulic connection between the coal seams and any aquifer stratigraphically above or below the coal seams. Separated by the impermeable Morrison Formation are the Jurassic-aged Sundance-Nugget aquifers. The Sundance-Nugget Formation is comprised of permeable sandstone, with traces of shale, siltstone, and limestone. The flow direction in the aquifers is not well defined (Collentine *et al.* 1981). The deepest aquifers are found in the Paleozoic era formations. The Triassic-aged aquifer is composed of fine to medium-grained sandstone, confined by the Chugwater Formation. The Pennsylvanian-aged aquifer is composed of dolomite and limestone and is confined by fine-grained Amsden sediments above and Cambrian rocks underneath (Collentine *et al.* 1981). These aquifers have produced flow rates up to 400 gallons per minute.

The depth of the proposed injection wells, which would be completed for the Haystack Mountain Formation, is expected to be between 3,000 feet and 5,000 feet. The rocks that compose the Mesaverde Group are conglomerates, consisting of sandstone, siltstone, mudstone, claystone, carbonaceous shale, limestone, and coal. Because these rocks were deposited as sea level changed during the Late Cretaceous Period, lithology varies vertically and laterally, and intertonguing is common among the various formations and strata that make up these aquifers. Recharge is mainly from infiltration of snowmelt and rainfall.

3.5.1.1 Quality

Groundwater quality is related to aquifer depth, flow between aquifers, and rock type. Groundwater quality is variable in the BCII PA. TDS, an indicator of salinity, is generally less than 2,000 mg/L (slightly saline to saline) in the BCII PA producing formations, with local concentrations less than 500 mg/L (considered fresh and meeting EPA National Secondary Drinking Water Regulations).

The proposed BCII wells occur in the Mesaverde Group aquifers. **Table 3-6** lists the major cation and anion composition of groundwater from the Mesaverde Group in the BCII PA. Sodium and bicarbonate dominate as the major ionic species. Collentine *et al.* (1981) offer three possible explanations for this dominance: (1) exchange of dissolved calcium for sodium; (2) sulfate reduction, resulting in generation of bicarbonate; and (3) intermixing of sodium-rich, saline water from low-permeability zones within the Mesaverde Group or adjacent aquifers.

Table 3-6
Major Ion Composition of Mesaverde Groundwater

Cation	Concentration (mg/L)	Anion	Concentration (mg/L)
Sodium	513	Bicarbonate ^a	1,284
Calcium	7	Carbonate ^b	9
Magnesium	3	Chloride	56
Potassium ^b	5	Sulfate	11

Notes:

mg/L= milligrams per liter.

^a *Bicarbonate was not measured; value shown was calculated from ion balance.*

^b *Concentrations of potassium and carbonate were not measured in well samples; values represent a composite of USGS data for Mesaverde wells in the vicinity of the project (USGS 1980).*

In addition to inorganic analysis, isotopic analysis has been performed on groundwater collected from numerous wells constructed within the interim drilling PODs. Groundwater samples from eight CBNG wells were analyzed for tritium, a radioactive isotope of hydrogen, deuterium, and ¹⁸O stable isotopes of hydrogen and oxygen.

Table 3-7 presents a comparison of groundwater quality from the Mesaverde Group, including WDEQ standards for groundwater suitability. The results from three gas wells analyzed indicate water that is generally suitable for livestock use, but is unsuitable for domestic supply or irrigation without treatment or dilution. Parameters measured at concentrations that exceed drinking water standards include iron, manganese, and TDS. Calculated values for sodium adsorption ratio (SAR) (47.3) and residual sodium carbonate (41 meq/L) exceed the agriculture suitability limits of eight for SAR and 1.25 for residual sodium carbonate. Unless the water supply were mixed with an existing water source of lower sodium, bicarbonate, and lower total salinity, irrigation with this water would reduce infiltration in the affected soil and potentially decrease crop production.

Table 3-7
Groundwater Quality for Mesaverde Wells in the BCII PA

Parameter	Concentration ^a	Unit	Groundwater Suitability Standards ^b		
			Domestic	Agriculture	Livestock
Aluminum	0.045	mg/L	---	5	5
Ammonia	0.9	mg/L	0.5	---	---
Arsenic	0.0006	mg/L	0.05	0.1	0.2
Barium	0.36	mg/L	1	---	---
Beryllium	<0.002	mg/L	---	0.1	---
Boron	0.25	mg/L	0.75	0.75	5
Cadmium	<0.0002	mg/L	0.01	0.01	0.05
Chloride	56	mg/L	250	100	2,000
Chromium	0.002	mg/L	0.05	0.1	0.05
Cobalt	NM	mg/L	---	0.05	1
Copper	0.03	mg/L	1	0.2	0.5
Cyanide	<5	mg/L	0.2	---	---
Fluoride	1.0	mg/L	1.4 - 2.4	---	---
Hydrogen Sulfide	NM	mg/L	0.05	---	---
Iron	3.06	mg/L	0.3	5	---
Lead	0.004	mg/L	0.05	5	0.1
Lithium	NM	mg/L	---	2.5	---
Manganese	0.102	mg/L	0.05	0.2	---
Mercury	<0.0004	mg/L	0.002	---	0.00005
Nickel	0.041	mg/L	---	0.2	---
Nitrate	<0.03	mg/L	10	---	---
Nitrite	<0.03	mg/L	1	---	10
Oil and Grease ^c	<1	mg/L	Virtually Free	10	10
Phenol	65	mg/L	0.001	---	---
Selenium	<0.005	mg/L	0.01	0.02	0.05
Silver	<0.003	mg/L	0.05	---	---
Sulfate	11	mg/L	250	200	3000
TDS	1,322	mg/L	500	2000	5000
Uranium	NM	mg/L	5	5	5
Vanadium	NM	mg/L	---	0.1	0.1
Zinc	0.3	mg/L	5	2	25
pH	8.2	s.u.	6.5 - 9.0	4.5 - 9.0	6.5 - 8.5
SAR	47.3	<none>	---	8	---

Parameter	Concentration ^a	Unit	Groundwater Suitability Standards ^b		
			Domestic	Agriculture	Livestock
RSC ^d	41	meq/L	---	1.25	--
Radium 226 + Radium 228	0.9	pCi/L	5	5	5
Strontium 90	NM	pCi/L	8	8	8
Gross alpha	NM	pCi/L	15	15	15

Notes:

meq/L = Milliequivalents per liter

mg/L = Milligrams per liter

NM = Not measured

pCi/L = Picocuries per liter

s.u. = Standard units

TDS = Total dissolved solids

^a Concentrations of boron, ammonia, fluoride, and nitrate/nitrite in samples from 11 Mesaverde groundwater wells (USGS 1980); remaining concentrations from three Mesaverde gas wells in BCII PA.

^b From WDEQ Water Quality Rules and Regulations, Chapter VIII.

^c Reported as total petroleum hydrocarbons.

^d Residual sodium carbonate calculated from measured calcium and magnesium concentrations and calculated concentration of bicarbonate.

3.5.2 Surface Water

The BCII PA is located within the Little Snake River drainage basin (United States Geological Survey [USGS] Hydrologic Unit Code 140500). An unnamed ephemeral tributary to Smiley Draw and Wild Horse Draw are located within the BCII PA. Smiley Draw and several other surface waters near the BCII PA flow into Deep Creek. Deep Creek is one of four primary ephemeral tributaries to Muddy Creek, which is an intermittent to perennial stream that carries water to its confluence with the Little Snake River (located near Baggs, Wyoming). The Little Snake River drains the west slopes of the Sierra Madre in south-central Wyoming and it joins the Yampa River in northwest Colorado. The Yampa River flows southwest to its confluence with the Green River in Utah.

3.5.2.1 Quantity

Flow statistics have been compiled from USGS gaging stations #0925900 and #09258980, which are located on Muddy Creek. There are no stream gaging stations in the BCII PA. Peak flows for streams within the BCII PA typically occur in late May and early June in response to snow melt. Following peak flow events, creeks and drainages only flow in direct response to rainfall events. This information is summarized in **Table 3-8**.

Table 3-8
Streamflow at Selected USGS Gaging Stations

Station Name	Station Number	Drainage Area (mi ²)	Period Of Record	Mean Flow (cfs)	Average Annual Runoff (ac-ft/yr)	Median Flow (cfs)	Min Flow (cfs)	Max Flow (cfs) and Date
Muddy Creek Near Baggs	09259000	1,257	10/1/87-9/30/91	14.8	10,690	2.8	0.03	632 3/23/88
Muddy Creek below Young Draw near Baggs	09258980	1,150	4/17/04-present	19.1	13,828	3.7	0.13	236 1/12/05

Source: USGS 2006

Notes:

mi² = square mile

cfs= cubic feet per second

ac-ft/yr= acre-feet per year

3.5.2.2 Quality

No water quality data is available for the BCII PA; however, some data is available for Muddy Creek and Smiley Draw (which are characteristic streams found in the Little Snake River drainage basin). Water quality data collected at the USGS gaging stations on Muddy Creek and Smiley Draw are shown in **Table 3-9**. In general, because many of these creeks only flow in response to precipitation events, sediment loads can be high. In addition, many areas with saline soils generally have higher TDS values.

Table 3-9
Surface Water Quality – Muddy Creek ^a

Station Name	Smiley Draw	Muddy Creek	Muddy Creek	Muddy Creek
Station Number	1409018F	09258900	09259000	09258980
Period of Records	1988-1989	1976-1978	1957-1991	May 2005-present
Number of Samples ^b	2	3	41	NM
pH, standard units	8.24	8.6	8.2	NM
Total Dissolved Solids (TDS) ^c	598	913	346	NM
Total Suspended Solids (mean)	61	6,198	3,191	NM
Turbidity (JTUs) ^d	NM	1,260	NM	NM
Hardness as CaCO ₃	0	315	270	NM

Station Name	Smiley Draw	Muddy Creek	Muddy Creek	Muddy Creek
Dissolved Oxygen	NM	11	10	NM
Sodium	1416	200	286	NM
Calcium	0.9	54	42	NM
Magnesium	0.5	44	40	NM
Potassium	2.4	7	9	NM
Bicarbonate	3,698	373	308	NM
Sulfate	1.05	380	320	NM
Chloride	5.9	65	32	NM
Conductance (mean) ^b		1,350	966	1,300

Source: USGS 2006

Notes:

^a Values all representative of means

^b Total number of grab samples analyzed; not every parameter was analyzed in every sample.

^c All units are milligrams per liter (mg/L), except as noted

^d Jackson Turbidity Units.

NM = Not measured

3.5.2.3 Waters of the United States

Most of the surface water features in the BCII PA qualify as waters of the U.S. The term “waters of the U.S.” generally includes all surface waters and their tributaries, impoundments, and wetlands. Waters of the U.S. other than wetlands, such as streams and intermittent drainages, are typically identified as having a defined bed and bank and an “ordinary high water mark” (OHWM). Activities that involve discharges of dredge or fill material into such areas is subject to regulation by the USACE pursuant to Section 404 of the Clean Water Act (CWA).

3.6 VEGETATION, WETLANDS, AND INVASIVE WEEDS

3.6.1 Vegetation and Cover Types

Vegetation in the BCII PA is dominated by alkali sagebrush (*Artemisia longiloba*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*); however, areas of higher elevation and steeper slopes contain juniper woodlands. Wyoming big sagebrush, juniper woodland, mountain big sagebrush mixed with mountain shrub, and basin big sagebrush represent secondary cover types mapped within the BCII PA (see **Table 3-10** for acreages). Vegetation cover types for the BCII PA were mapped for the Atlantic Rim EIS (see **Figure 3-4**). This data has been used to delineate vegetation cover type boundaries for the BCII PA. Information for plant species of concern was obtained from the Wyoming Natural Diversity Database (WYNDD) (2005).

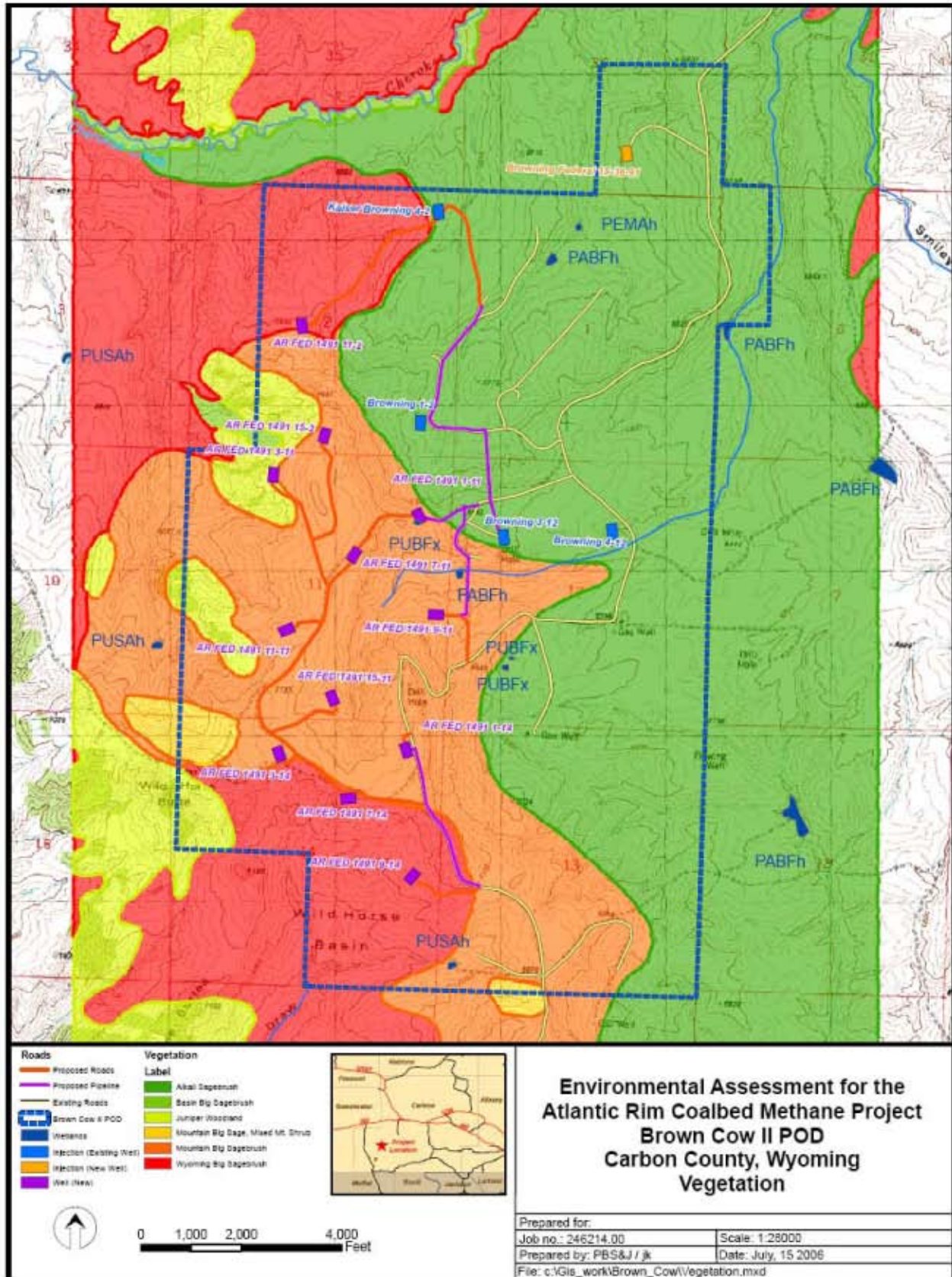
Table 3-10
Vegetation Cover Types within the BCII PA

Vegetation Cover Type	Primary	
	Acres	Percent
Alkali sagebrush	1,842.6	49.9
Mountain big sagebrush	1,158.5	31.4
Wyoming big sagebrush	509.8	13.8
Juniper woodland	143.9	3.9
Mountain big sagebrush mixed with mountain shrub	32.4	0.9
Basin big sagebrush	4.8	0.1
TOTAL	3,692	100

The northeastern portion of the BCII PA is dominated by alkali sagebrush. This sagebrush is typically found below 7,500 feet in clay soils with high cation exchange capacity. Common grass and forb species associated with alkali sagebrush include: bottlebrush squirreltail (*Elymus elymoides*), mutton bluegrass (*Poa fendleriana*), little bluegrass (*Poa secunda*), western wheatgrass (*Pascopyrum smithii*), Indian ricegrass (*Achnatherum hymenoides*), false dandelion (*Agoseris glauca*), Hood's phlox (*Phlox hoodii*), hollyleaf clover (*Trifolium gymnocarpon*), penstemon (*Penstemon* sp.), and biscuitroot (*Lomatium caruifolium*).

In addition to alkali sagebrush, the mountain big sagebrush cover type is also dominant within the BCII PA and is typically found at elevations around 7,000 feet and higher. This multi-branched shrub varies in height and density based on soils, moisture, and topography. Common grass species associated with mountain big sagebrush include: thickspike wheatgrass (*Elymus macrourus*), bluebunch wheatgrass (*Pseudoregneria spicata*), little bluegrass, needle-and-thread (*Hesperostipa comata*), bottlebrush squirreltail, prairie junegrass (*Koeleria cristata*), mutton bluegrass, green needlegrass (*Nassella viridula*), oniongrass (*Melica bulbosa*), Idaho fescue (*Festuca idahoensis*), and spike fescue (*Leucophaea kingii*). The shrub understory of mountain big sagebrush generally includes rabbitbrushes (*Chrysothamnus* spp.) and snowberry (*Symphoricarpos oreophilus*), with lesser amounts of bitterbrush (*Purshia tridentata*) and serviceberry (*Amelanchier alnifolia*).

**Figure 3-4
Vegetation**



3.6.2 Federal Threatened and Endangered Plant Species

Three Federally-listed plant species, the blowout penstemon (*Penstemon haydenii*), Ute ladies'-tresses (*Spiranthes diluvialis*), and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) are listed as potentially occurring on lands administered by the RFO (USDI-FWS 2003). However, only the blowout penstemon and Ute ladies'-tresses could potentially occur in the Carbon County portion of lands administered by the RFO.

Blowout penstemon

Blowout penstemon is a member of the Scrophulariaceae (Figwort) family (Fertig 2001) and is one of the rarest plant species native to the Great Plains (Nebraska Game and Parks Commission [NGPC] 2002). The species is found in the open, sandy habitats of wind-excavated depressions (blowouts) in dune tops. In Wyoming, the species has also been documented on very steep, unstable sand dunes. Within these limited habitats, this short-lived perennial herb frequently occurs in large, multi-stemmed clumps. In June and July, when it is in bloom in Wyoming, its lavender-purple flowers stand out against other sparse vegetation found in and around sandy blowouts.

Blowout penstemon, a USFWS endangered species, is known to occur in certain habitats south of the Ferris Mountains in the northern part of Carbon County. Suitable habitat for blowout penstemon is not present in the BCII PA; therefore, this species is not expected to occur within the BCII PA.

Ute ladies'-tresses

The Ute ladies'-tresses (*Spiranthes diluvialis*), a USFWS threatened species, is a perennial, terrestrial orchid, endemic to moist soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows at elevations from 4,200 feet to 7,000 feet. The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges, persisting in those areas where the hydrology provides continual dampness in the root zone throughout the growing season. This species has been located in Converse, Goshen, Laramie, and Niobrara Counties in Wyoming (Fertig 2000). Ute ladies'-tresses typically blooms from late July through August; however, it has been known to bloom in early July and as late as early October (USDI-FWS 2003). Suitable habitat for the Ute ladies'-tresses does not occur within the BCII PA; therefore, this species is not expected to occur within the BCII PA.

3.6.3 Species of Concern

Seven plant species of special concern may potentially occur on or near the BCII PA (USDI-BLM 2002, WYNDD 2005). Plants of special concern that may occur in the RFO management area and information on sensitivity status, probability of occurrence in the BCII PA, and descriptions of habitat types in which these special concern plants are found are listed in **Table 3-11**. Of these, Gibben's beardstongue has the highest conservation priority (WYNDD 2005) and particular attention should be given to avoid impact to this species. None of the species listed have known occurrences within the BCII PA (WYNDD 2005).

Table 3-11
Sensitive Plant Species with Potential to Occur On or Near the BCII PA

Common Name	Scientific Name	Sensitivity Status ¹	Habitat	Occurrence Potential ²
Cedar rim thistle	<i>Cirsium ownbeyi</i>	G2Q/S2	Barren, chalky hills, gravelly slopes and fine textured, sandy-shaley draws from 6,700 feet to 7,200 feet.	Unlikely
Gibben's beardtongue	<i>Penstemon gibbensii</i>	G1/S1	Barren south-facing slopes on loose sandy-clay derived from Brown's Park formation; may occur in grass-dominated sites with scattered shrubs; semi-barren fringed sagebrush/thickspike wheatgrass communities with 15-20% vegetation cover, or ashy slopes amid <i>Cercocarpus montanus</i> ; may also occur on outcrops of Green River Formation on steep yellowish sandstone-shale slopes below caprock edges.	Possible
Laramie Columbine	<i>Aquilegia laramiensis</i>	G2/S2, FRS2	Crevice of granite boulders and cliffs 6,400 feet to 8,000 feet.	Unlikely
Laramie false sagebrush	<i>Sphaeromeria simplex</i>	G2/S2	Cushion plant communities on rocky limestone ridges and gentle slopes 7,500 feet to 8,600 feet.	Unlikely
Nelson's milkvetch	<i>Astragalus nelsonianus</i>	G2/S2	Alkaline clay flats, shale bluffs, pebbly slopes and volcanic cinders in sparsely vegetated sagebrush, juniper and barren clay slopes 6,500 feet to 8,200 feet.	Possible
Persistent sepal yellowcress	<i>Rorippa calycina</i>	G3/S2S3	Riverbanks and shorelines, usually on sandy soils near high-water line.	Unlikely
Weber's scarlet gilia	<i>Ipomopsis aggregate ssp. Weberi</i>	G5T1T2Q/S1, FSR2	Openings in coniferous forests and scrub oak woodlands 8,500 feet to 9,600 feet.	Unlikely
Wolf's orache	<i>Atriplex wolfii</i>	G3/G4/S1	Alkaline or clay soils; elevated mounds near aquatic sites; associated with greasewood.	Possible

Sources: USDI-BLM (2002), WYNDD (2005).

Notes:

¹ Definition of status:

G Global rank: Rank refers to the range-wide status of a species.

T Trinomial rank: Rank refers to the range-wide status of a subspecies or variety.

S State rank: Rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.

1 Critically imperiled because of extreme rarity (often known from five or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.

2 Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.

- 3 Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).
 - 4 Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
 - 5 Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.
- ² Occurrence potential based upon presence of suitable habitat, known distribution, WYNDD records, WGFD records, and field surveys.

3.6.4 Wetlands

The location and classification of potential wetlands within the BCII PA were determined from USFWS National Wetlands Inventory (NWI) data. Four types of wetland features (totaling 4.2 acres) are located within the BCII PA. The Cowardin System (Cowardin *et al.* 1979) classifies the wetland types as follows (see **Table 3-12**): PABFh – Palustrine, aquatic bed, semipermanently flooded, diked/impounded; PEMAh – Palustrine, emergent, temporarily flooded, diked/impounded; PUBFx – Palustrine, unconsolidated bottom, semipermanently flooded, excavated; and PUSAh – Palustrine, unconsolidated shore, temporarily flooded, diked/impounded. The BLM does not have any Proper Functioning Class (PFC) data for the BCII PA. The closest PFC data is to the north and northeast of the BCII PA in the Cherokee Creek and Smiley Draw watersheds and no apparent concerns were identified for either of these areas.

Table 3-12
USFWS National Wetlands Inventory

Classification of Wetlands Present Within the BCII PA

Wetland Type ^a	Polygon Features		
	Count	Wetland Type	Acres
PABFh	3	Freshwater Pond	2.2
PEMAh	1	Freshwater Emergent Wetland	0.3
PUBFx	3	Freshwater Pond	0.7
PUSAh	1	Freshwater Pond	1.0
Total	8		4.2

Source: USFWS NWI data.

Note:

^a See Cowardin *et al.* (1979) for classification description. Available at the NWI website: http://www.nwi.fws.gov/Pubs_Reports/public.htm

3.6.5 Noxious and Invasive Weeds

Weed invasion and establishment is present in the BCII PA. A field survey on April 12th and 13th, 2006 was conducted to investigate the presence of noxious or invasive species along existing and proposed roads and well pad sites within the BCII PA. The following invasive species were documented in small scattered patches along existing roads and previously disturbed pad sites within the BCII PA: black henbane (*Hyoscyamus niger*), cheat grass (*Bromus tectorum* L.), curlycup gumweed (*Grindelia squarrosa*), annual goosefoot (*Chenopodium spp.*),

and bull thistle (*Cirsium vulgare*). There is one previously document occurrence of Russian knapweed (*Salsola iberica*) within as well as one mapped occurrence north of the BCII PA.

No State-listed noxious weed species (see **Table 3-13**) were documented within the BCII PA during the field survey; however, this area is vulnerable to invasion of noxious and invasive weed species such as Canada thistle (*Cirsium arvense*), spotted knapweed (*Centaurea maculosa* Lam.), musk thistle (*Carduus nutans*), whitetop (*Cardaria draba*), as well as invasive species such as, halogeton (*Halogeton glomeratus*), and several annual mustards, which have been documented within the ARPA (USDI-BLM 2005). These invasive and noxious species are normally restricted to disturbed areas.

Any newly disturbed surface (e.g. well pads, pipeline and road ROWs) within the BCII PA would be susceptible to invasive/noxious weed infestations. In addition, seeds can be transported along highways and roads by construction equipment and vehicles. **Table 3-13** shows the current designated noxious weed list for Wyoming.

Table 3-13
Designated Noxious Weeds in Wyoming

Scientific Name	Common Name
<i>Agropyron repens</i>	Quackgrass
<i>Ambrosia tomentosa</i>	Skeletonleaf bursage
<i>Arctium minus</i>	Common burdock
<i>Cardaria draba</i> , <i>C. pubescens</i>	Hoary cress, whitetop
<i>Carduus acanthoides</i>	Plumeless thistle
<i>Carduus nutans</i>	Musk thistle
<i>Centaurea diffusa</i>	Diffuse knapweed
<i>Centaurea maculosa</i>	Spotted knapweed
<i>Salsola iberica</i>	Russian knapweed
<i>Chrysanthemum leucanthemum</i>	Ox-eye daisy
<i>Cirsium arvense</i>	Canada thistle
<i>Convolvulus arvensis</i>	Field bindweed
<i>Cynoglossum officinale</i>	Houndstongue
<i>Euphorbia esula</i>	Leafy spurge
<i>Isatis tinctoria</i>	Dyers woad
<i>Lepidium latifolium</i>	Perennial pepperweed
<i>Linaria dalmatica</i>	Dalmatian toadflax
<i>Linaria vulgaris</i>	Yellow toadflax
<i>Lythrum salicaria</i>	Purple loosestrife
<i>Onopordum acanthium</i>	Scotch thistle
<i>Sonchus arvensis</i>	Perennial sowthistle
<i>Tamarisk spp.</i>	Salt cedar
<i>Hypericum perforatum</i>	Common St. Johnswort
<i>Tanacetum vulgare</i>	Common tansy

Source: Designated Noxious Weeds, Wyoming Stat. § 11-5-102 (a)(xi) and Prohibited Noxious Weeds, Wyoming Stat. § 11-12-104.

In addition to the 24 species listed in **Table 3-13**, halogeton, plains prickly pear, larkspur, and lupine are declared noxious by Carbon County (Justesen 2004).

3.7 RANGE RESOURCES/LAND USE

The BCII PA is comprised entirely of Federally-owned lands and is located completely within the Cherokee Grazing Allotment (CGA). The CGA encompasses approximately 73,966 acres, the majority of which is public land. Cattle (cow/calf) and sheep are pastured in the CGA, which supports 6,412 cattle animal unit months (AUMs) and 1,588 sheep AUMs, for a total of 8,000 AUMs. The average stocking rate is approximately eight acres per AUM (Warren 2005).

The CGA is divided into six main pastures. The BCII PA falls within two of these pastures: the Deep Creek pasture to the south and the Cherokee Creek pasture to the north. Both pastures are grazed by sheep and cattle on a seasonal rotation. In year one, sheep are grazed in the spring and cattle are grazed in the summer. In year two, cattle are grazed in the spring and sheep are grazed in the fall.

Land Use

Land use adjacent to the BCII PA includes agricultural activities, wildlife habitat, oil and natural gas exploration, and dispersed outdoor recreation. Agricultural activities are primarily related to cattle and sheep grazing.

3.8 WILDLIFE

The BCII PA is located in the sagebrush steppe plant community that is typical of the high inter-mountain desert of south-central Wyoming. The primary vegetation type in the BCII PA is mountain big sagebrush. The BCII PA includes approximately 3,058 acres of sagebrush steppe/mixed grass wildlife habitat. Many common species of birds, mammals, amphibians, and reptiles are found within the BCII PA. The analysis area for the greater sage-grouse consisted of the BCII PA plus a two-mile buffer. The analysis area for raptors included the BCII PA plus a one-mile buffer. **Figures 3-5 through 3-7** show the locations of critical wildlife resources located within and adjacent to the BCII PA.

Information regarding the potential occurrence of Federally-listed threatened or endangered species, species of concern, big game, raptors, and greater sage-grouse on and adjacent to the BCII PA was obtained from several sources. Greater sage-grouse lek locations, seasonal big game range designations, and locations of threatened and endangered species were obtained from the Wyoming Game and Fish Department's (WGFD) Wildlife Observation System (WOS), WGFD regional biologists, the BLM, and the WYNDD. The WGFD big game herd unit annual reports were used for herd unit population statistics. Greater sage-grouse lek and raptor nest locations were obtained from the WGFD and the BLM RFO.

Existing wildlife information for the BCII PA was also supplemented through survey data collected by Hayden-Wing Associates (HWA) biologists between 2001 and 2004. Wildlife surveys performed by HWA from 2001-2003 were conducted as part of larger-scale surveys being performed in preparation for the Atlantic Rim EIS. Wildlife field work included: (1) a helicopter survey to determine the status of nesting raptors, (2) ground-truthing and mapping of white-tailed prairie dog towns, (3) the identification and mapping of potential mountain plover habitat, and (4) a helicopter survey to locate habitat areas being used by greater sage-grouse during severe winter conditions. Surveys for presence/absence of mountain plover were conducted in potential habitat areas for three consecutive years from 2001-2003. In addition, the BLM RFO continues to update plover data yearly. Information regarding the potential occurrence of sensitive species within the BCII PA was also obtained from the WYNDD.

**Figure 3-5
General Wildlife**

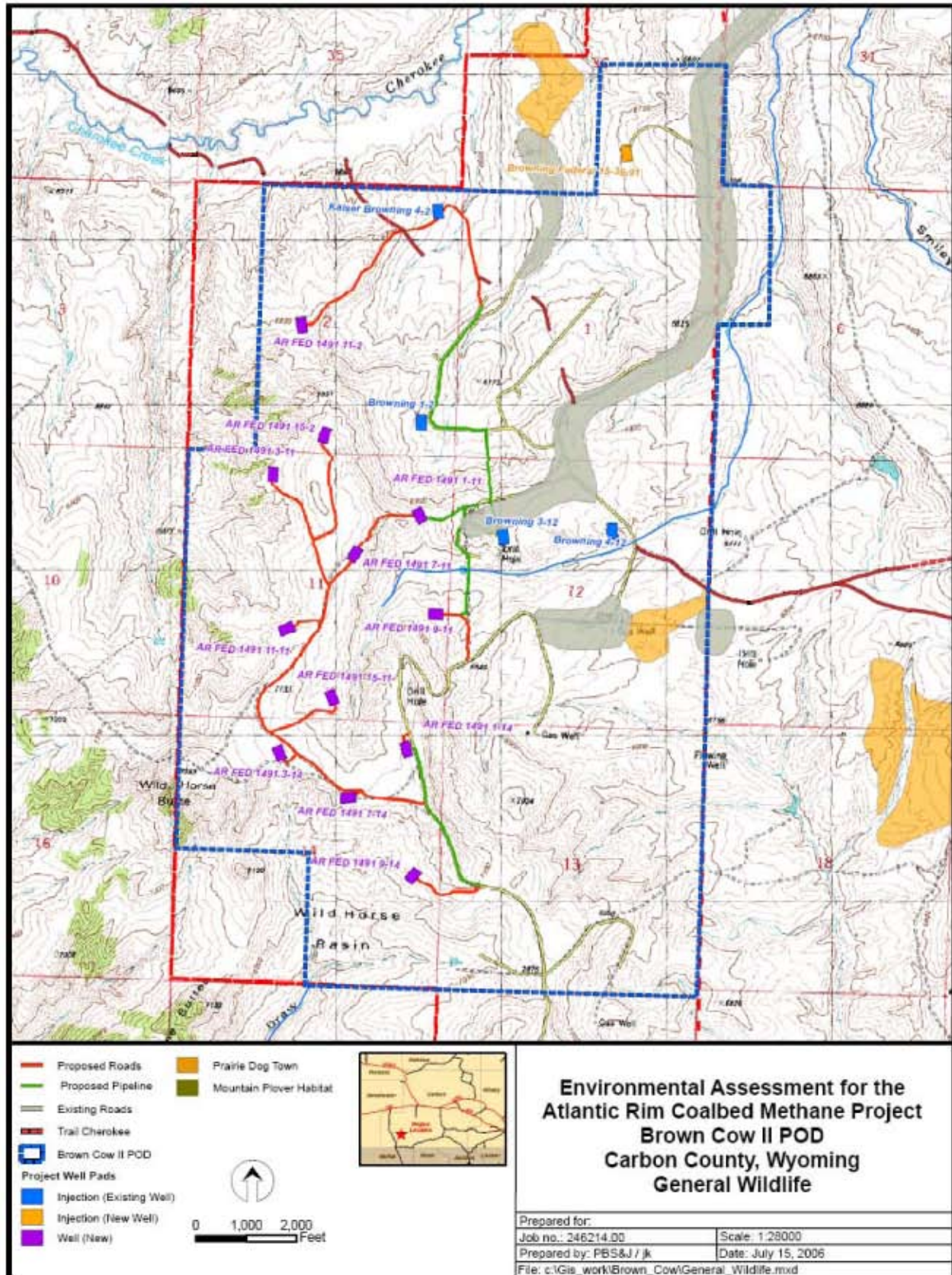


Figure 3-6
Sage Grouse Leks

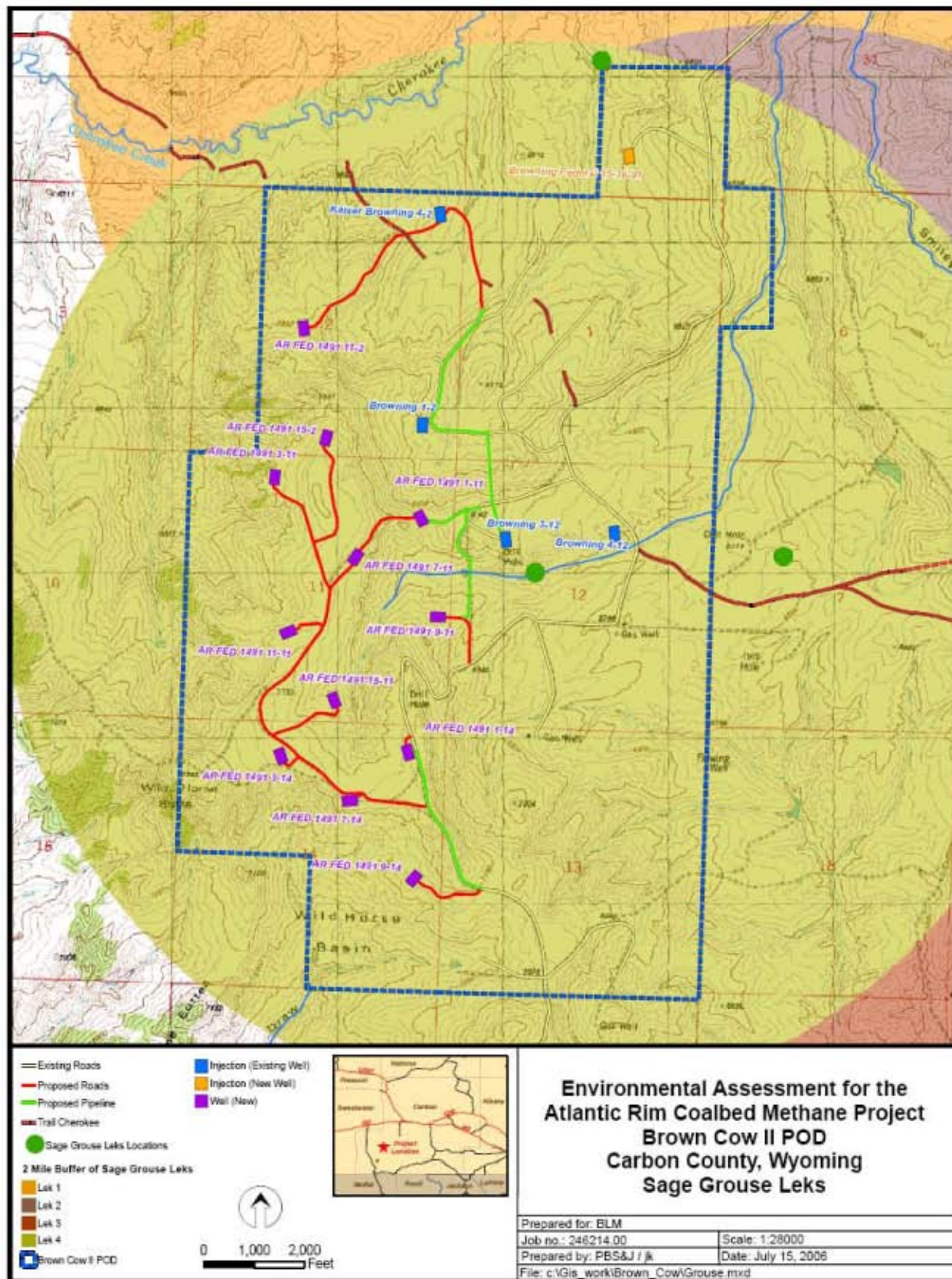
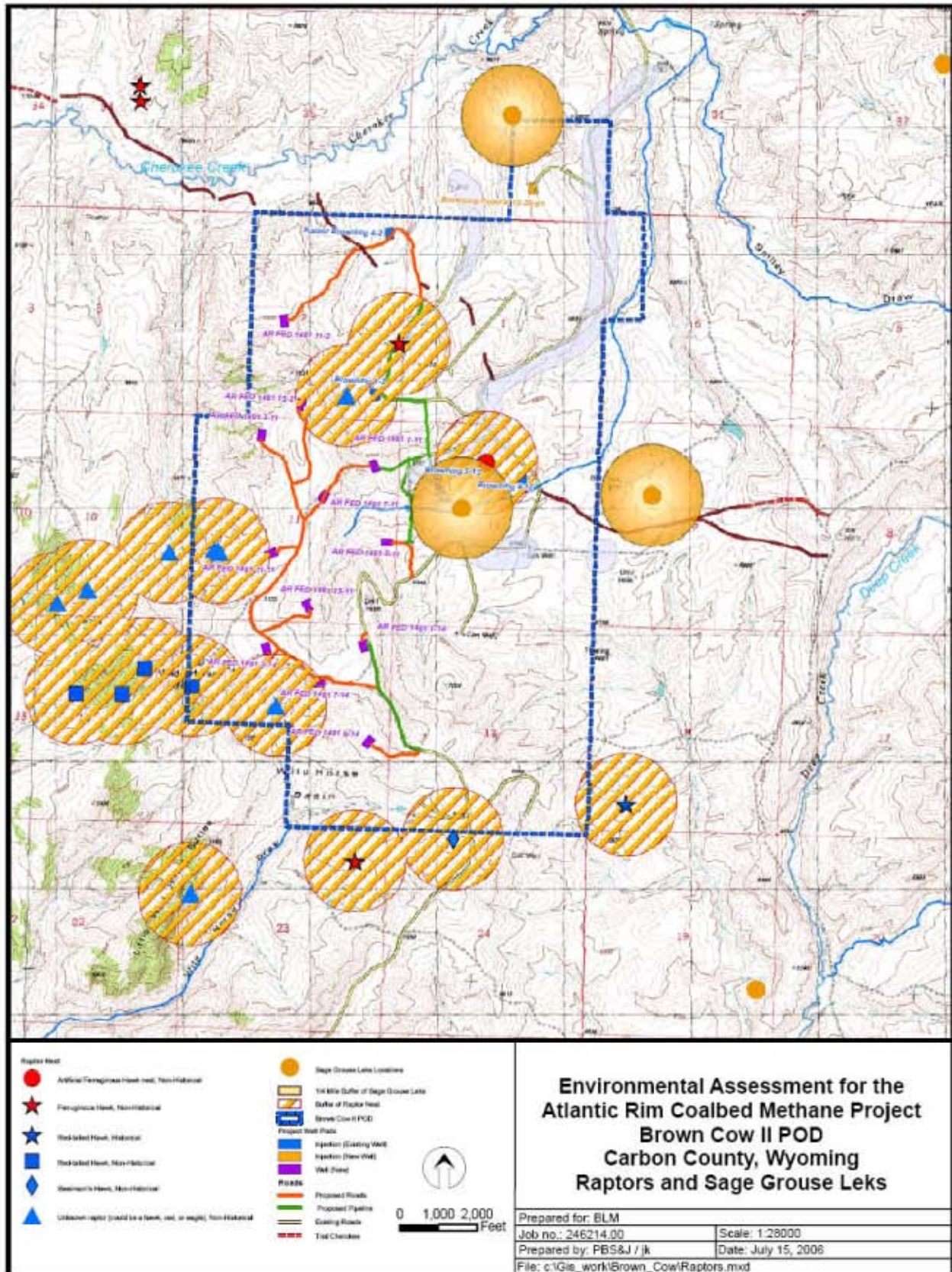


Figure 3-7
Raptors and Sage Grouse Leks



3.8.1 Big Game

Three big game species – pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*) – utilize the BCII PA during the year. Three seasonal ranges, designated by the WGFD, occur within the BCII PA: crucial winter/yearlong, winter, and winter/yearlong. Crucial big game range (e.g. crucial winter/yearlong range) includes any seasonal range or habitat component that has been documented as a determining factor in a population's ability to maintain itself at a specified level over the long-term. Winter ranges are used by substantial numbers of animals only during the winter months (November through April). Winter/yearlong ranges are occupied throughout the year, but during winter there is a significant influx of additional animals into the area from other seasonal ranges. No spring/summer/fall ranges have been documented by the WGFD within the BCII PA.

3.8.1.1 Pronghorn Antelope

The BCII PA is located within the 1,394-square mile Baggs Pronghorn Antelope Herd Unit and the entire BCII PA (3,692 acres) has been designated winter/yearlong range (see **Figure 3-8**). The 2004 population estimate for the Baggs Herd Unit was 11,300 animals, which was 26% above the objective of 9,000 (WGFD 2004a). The BCII PA is located within Hunt Area 55, where the hunter success rate in 2004 was 93.3%.

3.8.1.2 Mule Deer

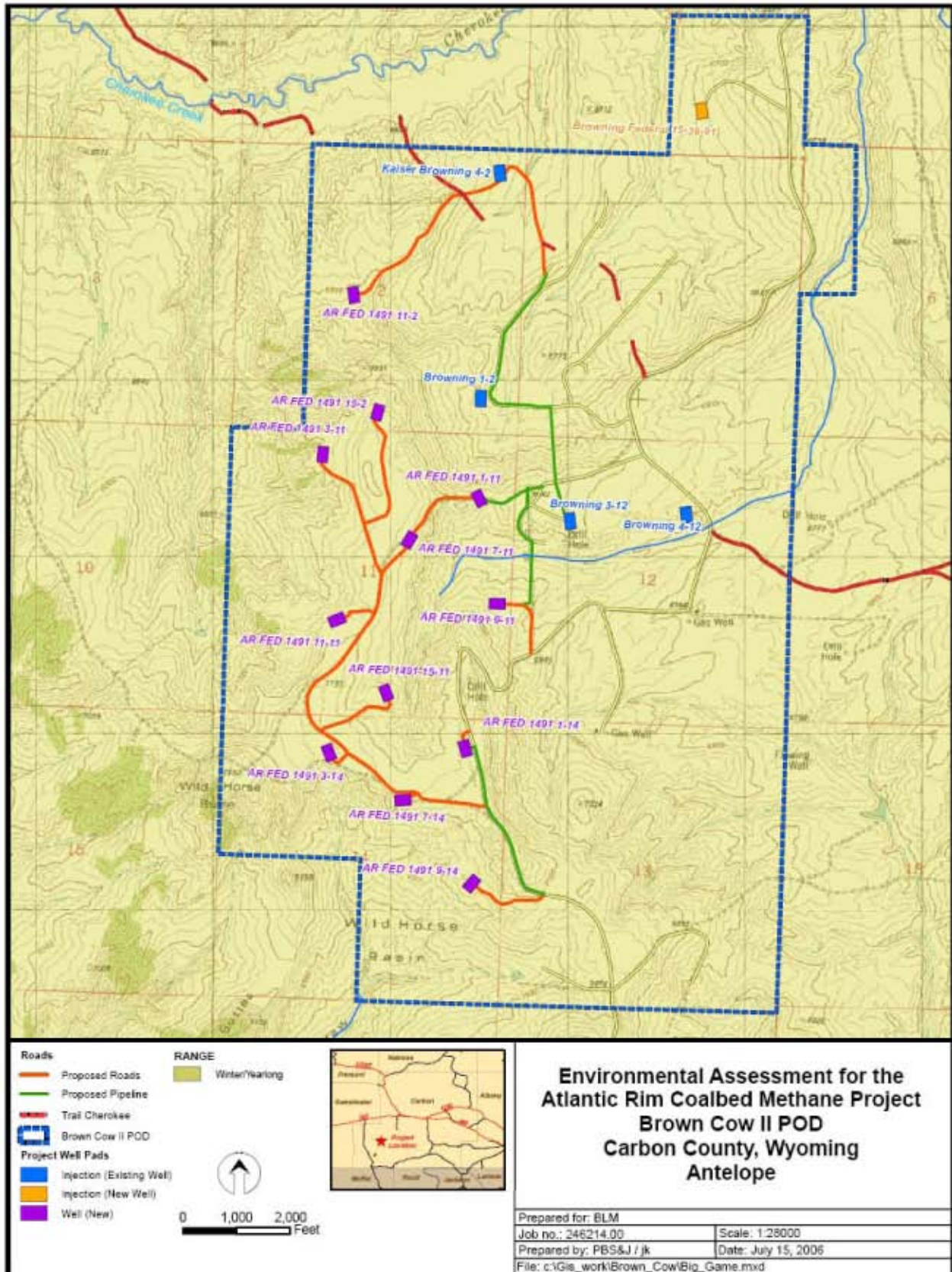
The BCII PA is located within the 3,440-square mile Baggs Mule Deer Herd Unit, which contains habitats ranging from subalpine and montane coniferous forests to desert scrub. The northeastern and northwestern portions of the BCII PA are within winter/yearlong range (2,070 acres) and the southwestern portion of the BCII PA (1,622 acres) is within crucial winter/yearlong range (see **Figure 3-9**). According to data gathered by Western Ecosystems Technology, Inc. (WEST) (2006), the BCII PA received both winter and transition use by mule deer with many deer migrating through the western half of the BCII PA to reach their summer ranges. Deer wintering in the Wild Horse/Muddy Mountain area appeared to use consistent migration routes through the BCII PA and north to transition ranges in the Sandhills and/or the Wild Cow/Deep Gulch areas (WEST 2006). The 2004 population estimate for the Baggs Herd Unit was 21,000 animals, which is 12% above the WGFD management objective of 18,700 (WGFD 2004a). The BCII PA is located within Hunt Area 82, where the hunter success rate in 2004 was 61.6%.

3.8.1.3 Elk

The BCII PA is located within the 2,425-square mile Sierra Madre Elk Herd Unit. Most elk in the herd unit utilize spring/summer/fall ranges in the Sierra Madre Mountains, although there are groups using habitats on the ARPA and around McCarty Canyon. During winter, the elk migrate to lower elevation winter range habitats on the west side of the Sierra Madre Mountains and into the ARPA/Sand Hills areas. **Figure 3-10** illustrates the elk's ranges. Some animals may migrate as far west as the Powder Rim (approximately 40 miles west of Baggs, Wyoming; Porter 1999); however, no major elk migration routes pass through the BCII PA. Almost the entire BCII PA (3,688.7 acres) is classified as elk winter range; the extreme northeast corner of the BCII PA (3.3 acres) is classified as winter/yearlong range. The 2004 population estimate for the Baggs Herd Unit was 11,200 animals, which is 143% above the WGFD management objective of 4,200

(WGFD 2004a). The BCII PA is located within Hunt Area 108, where the hunter success rate in 2004 was 76%.

Figure 3-8
Antelope Seasonal Range



**Figure 3-9
Mule Deer Seasonal Range**

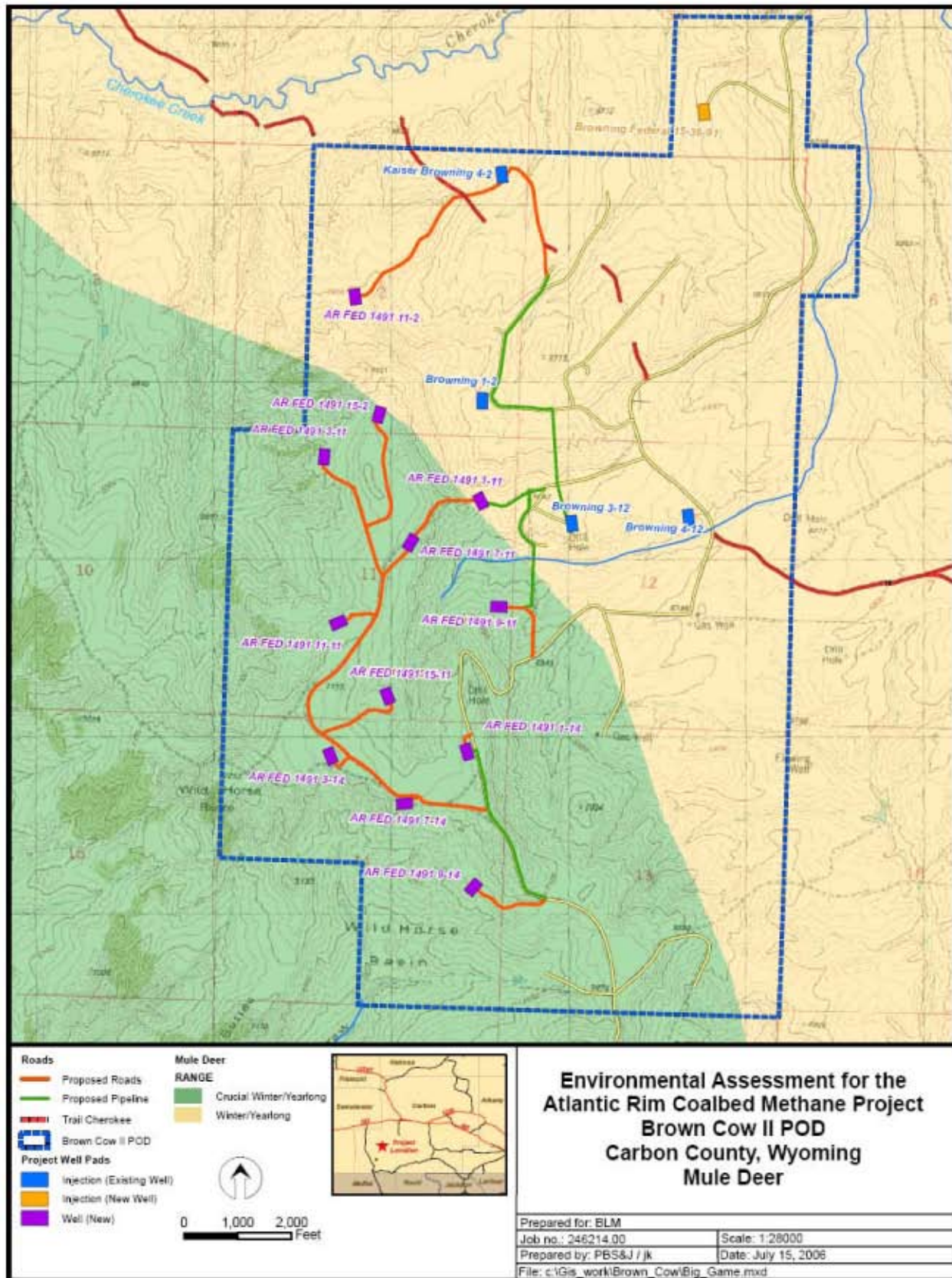
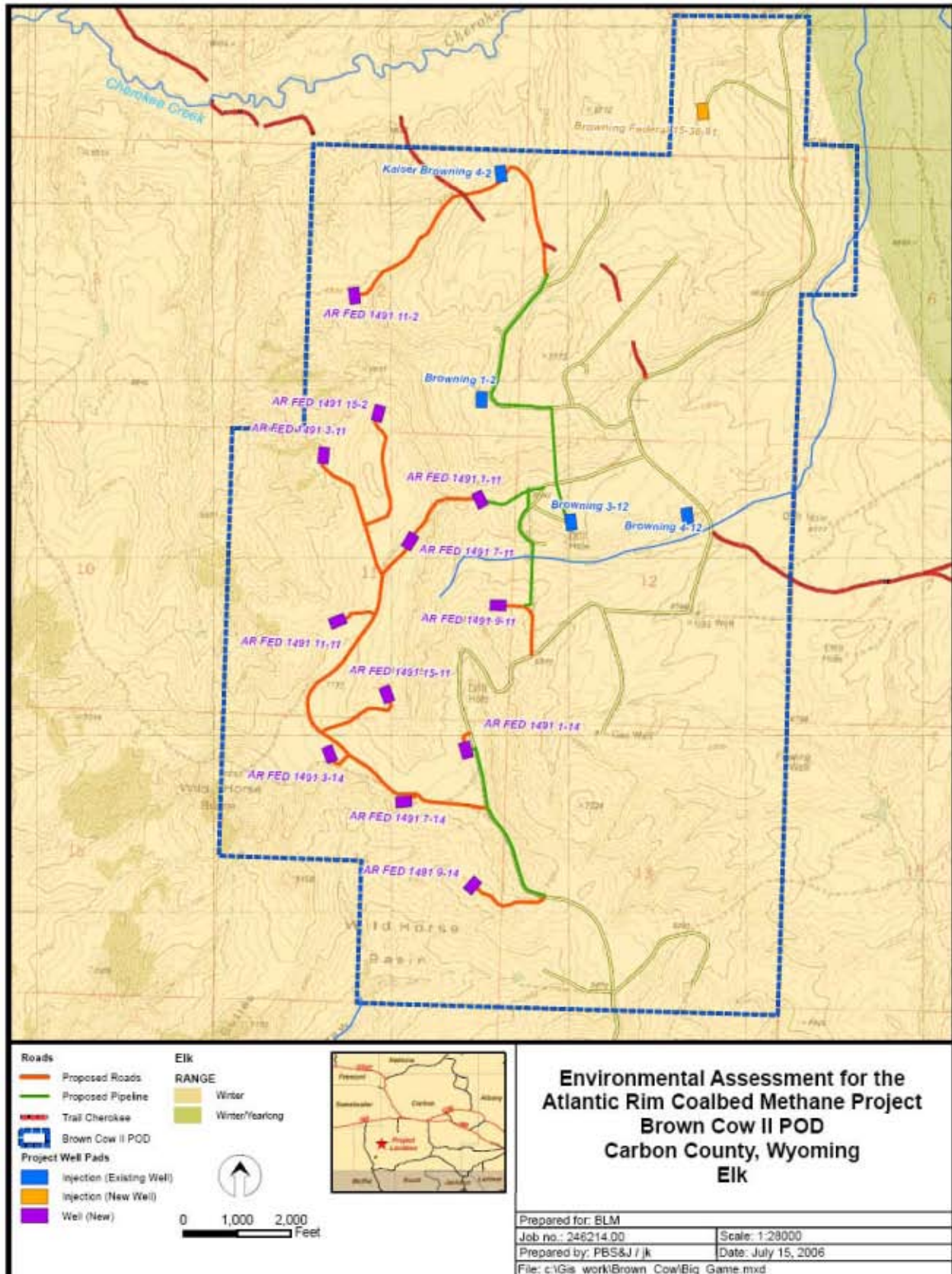


Figure 3-10
Elk Seasonal Range



3.8.2 Upland Game Birds

3.8.2.1 Greater Sage-Grouse

The BCII PA is located within the extensive sagebrush/grassland habitat of south-central Wyoming, where greater sage-grouse (*Centrocercus urophasianus*) are common inhabitants. Strutting grounds (leks), nesting, brood-rearing, and wintering habitats are all important habitat components required by greater sage-grouse. Sometimes these habitats are contiguous and other times occur in a patchy, disconnected pattern (Call and Maser 1985). Approximately 50% of greater sage-grouse hens usually nest within two miles of leks (Braun *et al.* 1977, Hayden-Wing *et al.* 1986, Wakkinen *et al.* 1992, Wallestad and Pyrah 1974). As a result, any sagebrush habitat within two miles of a lek is considered potential nesting habitat. In response to petitions to list the greater sage-grouse under the ESA, the FWS completed a status review of this species throughout its range and, on January 7, 2005, determined that it did not warrant protection under the ESA. However, the greater sage-grouse is considered a sensitive species by the BLM in Wyoming.

The BCII PA is located within the Sierra Madre Upland Game Management Area (Area 25). According to the Annual Report of Upland Game and Furbearer Harvest for 2004, 954 greater sage-grouse were harvested in Area 25, providing 920 hunter recreation days (WGFD 2004b). The Sierra Madre Upland Game Management Area accounted for approximately 8% of the state-wide harvest of greater sage-grouse in 2004.

Based upon surveys conducted by the WGFD, BLM, and HWA, there are four occupied leks within two miles of the BCII PA (see **Figures 3-6** and **3-7**). The WGFD defines an occupied lek as one that has been active during at least one strutting season within the last 10 years. Management protection is afforded to occupied leks and the entire BCII PA is located within two miles of greater sage-grouse leks; therefore, the BCII PA is subject to seasonal restrictions to protect nesting greater sage-grouse. Survey results from 2000-2005 for leks have been summarized in **Table 3-14**. Sage-grouse lek observation history reports were obtained from the WGFD.

Table 3-14
Sage Grouse Lek Observation Summary (2000 – 2005)

Lek	Year	Number of Observations	Maximum Males Counted	Average Males Counted	Maximum Females Counted	Average Females Counted	Lek Status
25-Cherokee Creek 2	2005	4	125	112	119	37	Occupied and active in 2005
	2004	5	86	65	71	15	
	2003	4	71	54	64	21	
	2002	6	85	42	7	36	
	2001	4	96	45	21	6	
	2000	2	61	34	51	25	
25- Wild Horse Mountain	2005	No Birds Located					Occupied- Last sign of activity observed in 1999
	2004	Not Checked					
	2003	Not Checked					
	2001	No Birds Located					
	2000	Not Checked					
25-Wild Horse Basin 3	2005	Not Checked					Occupied- Last sign of activity observed in 2001
	2004	No Birds Located					
	2003	Not Checked					
	2002	Not Checked					
	2001	20 Birds Observed- Sex Unknown					
	2000	Not Checked					
25-Wild Horse Basin 2	2005	2	107	104	22	12	Occupied and active in 2005
	2004	Not Checked					
	2003	Not Checked					
	2002	2	31	15	0	0	
	2001	45 Birds Observed- Sex Unknown					
	2000	Not Checked					

3.8.2.2 Raptors

Raptor species that may occur on or near the BCII PA include the golden eagle, bald eagle, northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, red-tailed hawk, Swainson's hawk, rough-legged hawk, ferruginous hawk, American kestrel, merlin, prairie falcon, peregrine falcon, short-eared owl, long-eared owl, great-horned owl, and burrowing owl.

Raptor nest data was obtained from the BLM RFO Raptor Monitoring Program, which was developed to track and document nest locations and apply stipulations for ground disturbance. Raptor data was last updated by the BLM in September 2005. The analysis area for raptors included the BCII PA plus a one-mile buffer.

Based upon data obtained from the BLM RFO, 19 raptor nests (five ferruginous hawk, four red-tailed hawk, one artificial ferruginous hawk, one Swainson's hawk, and eight unknown nests) were documented within the analysis area and are shown on **Figure 3-7**. An unknown raptor nest could be a hawk, owl, or eagle nest. All 19 nests have been mapped as "non-historical," which is defined as a nest that still presents a nesting opportunity.

3.8.3 Special Status Species – Wildlife

Special status species include Federal threatened, endangered, and candidate species listed by the USFWS under the ESA. The USFWS has determined that three wildlife species listed as threatened, endangered, or candidate under the ESA may potentially be found on lands administered by the RFO. These species are the threatened bald eagle (*Haliaeetus leucocephalus*), endangered black-footed ferret (*Mustela nigripes*), and the threatened Canada lynx (*Lynx canadensis*) (USDI-FWS 2003).

3.8.3.1 Threatened and Endangered Species – Wildlife

Black-Footed Ferret and Associated White-Tailed Prairie Dog Colonies

The black-footed ferret's original distribution in North America closely corresponded to that of prairie dogs (Hall and Kelson 1959, Fagerstone 1987). In Wyoming, white-tailed prairie dog (*Cynomys leucurus*) colonies provide habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food and they also use prairie dog burrows for shelter, parturition, and raising their young (Fagerstone 1987).

Prairie dog colonies within the BCII PA were mapped during the summers of 2000 and 2001, though both are incomplete. The boundaries of two prairie dog colonies were mapped using a handheld Global Positioning System unit and an all-terrain vehicle and the locations of these colonies are shown on **Figure 3-5**. One colony, totaling 24.9 acres, is located in the eastern portion of the BCII PA. This colony is located in a block-cleared zone; therefore, black-footed ferret surveys are not necessary. One colony, totaling 43.6 acres, was mapped in the northern section of the BCII PA; this colony is not in a block-cleared zone. According to USFWS guidelines (2004), prairie dog complexes greater than 200 acres in size that contain colonies within 4.3 miles of each other represent potential habitat for black-footed ferrets. Neither of the colonies located in the BCII PA meet these criteria; therefore, black-footed ferret surveys are not necessary. In addition, whenever possible, project features were re-located to avoid prairie dog colonies.

A search of the WGFD database determined that there are no documented occurrences or sightings of black-footed ferrets within the BCII PA. A black-footed ferret survey was not conducted within the 43.6-acre colony.

Canada Lynx

Records of Canada lynx in Wyoming indicate that most lynx or signs of lynx between 1973 and 1986 were in spruce-fir (41%) and lodgepole pine (18%) communities (Reeve *et al.* 1986). According to Reeve *et al.* (1986), more than 50% of lynx records in Wyoming occurred in the northwestern region of the State. The closest a lynx was recorded to the BCII PA was near the Medicine Bow River in 1856 (Reeve *et al.* 1986); there have been no recorded sightings or signs of lynx in Carbon County since then.

A search of the WGFD database determined that there are no documented occurrences or sightings of Canada lynx within the BCII PA. It is highly unlikely that lynx occur in the BCII PA because: (1) the BCII PA does not include high elevation lodgepole pine/spruce-fir habitat types preferred by the species, (2) it does not support a population of snowshoe hares (preferred prey item), (3) there are no recorded lynx sightings near the BCII PA, and (4) the closest potential habitat (lynx analysis unit (LAU)) is more than 10 miles away in the Sierra Madre Mountains.

Bald Eagle

Primary bald eagle wintering areas are typically associated with concentrations of food sources along major rivers that remain unfrozen, where fish and waterfowl are available, and near ungulate winter ranges that provide carrion (Montana Bald Eagle Working Group 1990). Wintering bald eagles are also known to roost in forests with large, open conifers and snags protected from wind by ridges, often near concentrations of domestic sheep and big game (Anderson and Patterson 1988).

A search of the WGFD database did not locate any recorded occurrences or sightings of bald eagles within the BCII PA. No communal bald eagle winter roosts are known to exist on or near the BCII PA. Review of BLM and raptor nest records as well as results of aerial and ground raptor nest surveys conducted by HWA reveal that no bald eagle nests occur within a two-mile radius of the BCII PA. The closest known nest is located approximately 18 miles southwest of the BCII PA in Section 11, T12N – R93W (Cerovski 2000). There is a potential for bald eagles to forage in the vicinity of the BCII PA, but would be unlikely due to the lack of associated habitat.

3.8.4 Species of Concern – Wildlife

The objective of the sensitive species designation is to ensure the overall welfare of the species is considered when undertaking actions on public lands and to ensure they do not contribute to the need to list the species under the provisions of the ESA. It is the intent of this policy to emphasize the inventory, planning consideration, management implementation, monitoring, and information exchange for the sensitive species on the list. The BLM Sensitive Species List for Wyoming is meant to be dynamic and will be reviewed annually with recommendations from BLM biologists and appropriate non-BLM authorities for additions and deletions (USDI-BLM 2002). Additionally, the WYNDD was reviewed on January 18, 2006 for potential occurrences of species of concern within the BCII PA (WYNDD 2005). In total, 29 species (six mammals,

16 birds, three amphibians, and four fish) occur on the RFO Sensitive Species List. **Table 3-15** lists the species of concern potentially occurring in the BCII PA.

Mammals

Six sensitive mammal species may potentially be found on or near the BCII PA. These include: Wyoming pocket gopher, white-tailed prairie dog, swift fox, fringed myotis, long-eared myotis, and Townsend's big-eared bat. Only one of these species, the white-tailed prairie dog, is known to occur within the BCII PA; two small towns (68.5 acres total) occur in the project area. The remaining species - Wyoming pocket gopher, swift fox, fringed myotis, long-eared myotis, and Townsend's big-eared bat - have a slight potential to occur on or adjacent to the BCII PA.

Additionally, the western small-footed myotis, silver-haired bat, Hoary bat, Wyoming ground squirrel, ringtail, and the black-footed ferret are listed by the WYNDD. Of these, the Hoary bat, Wyoming ground squirrel, and black footed ferret may potentially occur in the BCII PA. It is unlikely that the western small-footed myotis, silver-haired bat, and ringtail because there is no suitable habitat for these species within the BCII PA.

Birds

Sixteen sensitive bird species may potentially be found on or near the BCII PA. These include: Baird's sparrow, Brewer's sparrow, long-billed curlew, western burrowing owl, yellow-billed cuckoo, loggerhead shrike, Columbian sharp-tailed grouse, greater sage-grouse, white-faced ibis, trumpeter swan, peregrine falcon, ferruginous hawk, mountain plover, and the northern goshawk. The western subspecies of yellow-billed cuckoo is considered a FWS candidate for listing as endangered. The WYNDD has also listed the golden eagle, merlin, sandhill crane, snowy plover, American avocet, short-eared owl, ash throated flycatcher, western scrub-jay, juniper titmouse, canyon wren, black-throated gray warbler, chestnut-collared longspur, and Scott's oriole to potentially occur in the BCII PA (WYNDD 2005). The yellow-billed cuckoo, white-faced ibis, northern goshawk, and trumpeter swan are unlikely to occur on or near the BCII PA.

The Brewer's sparrow, sage sparrow, sage thrasher, greater sage-grouse and Ferruginous hawk are known to be present within the BCII PA.

One ferruginous hawk nest is located in the northern portion of the BCII PA adjacent to an existing road. Two ferruginous hawk nests were found to be located directly south of the BCII PA boundaries and two are located north of the project boundaries. Additionally, eight unknown raptor nests were located within the project area. There is a possibility that these nests could be of hawk, owl, or eagle origin.

There is a possibility that the Baird's sparrow, burrowing owl, chestnut-collared longspur, Columbian sharp-tailed grouse, golden eagle, loggerhead shrike, long-billed curlew, merlin, mountain plover, peregrine falcon, sage sparrow, sage thrasher and short-eared owl may occur in the BCII PA.

Due to a lack of suitable habitat, it is unlikely that the American avocet, ash-throated flycatcher, black-throated gray warbler, canyon wren, juniper titmouse, Scott's oriole, snowy plover, trumpeter swan, western scrub-jay, white-faced ibis and the yellow-billed cuckoo would occur in the BCII PA.

Amphibians

Three sensitive amphibian species may potentially be found on or near the BCII PA. These include: boreal toad, Great Basin spadefoot toad, and northern leopard frog. The WYNDD lists the tiger salamander and great basin spadefoot toad as potentially occurring in the BCII PA. All five species are unlikely to occur on the BCII PA due to the absence of wetlands and water bodies.

Reptiles

One sensitive reptile species, the northern plateau lizard is listed as likely to occur within the BCII PA by WYNDD. There is a possibility of this species being found within the project boundaries.

Fish

The roundtail chub, bluehead sucker, flannelmouth sucker and Colorado River cutthroat are listed by the RFO Sensitive Species list to potentially occur in the BCII PA. No fish are found in the BCII PA due to the lack of any perennial streams.

Table 3-15
Sensitive Wildlife and Fish Species Potentially Present On or Near the BCII PA

Common Name	Scientific Name	Sensitivity Status ¹	Habitat	Occurrence Potential ²
Mammals				
Black-footed ferret	<i>Mustela nigripes</i>	G1/S1	In or near prairie dog colonies, generally on short or mixed-grass prairies.	Possible
Fringed myotis	<i>Myotis thysanodes</i>	R2, G5/S1B, S1N, NSS2	Conifer forests, woodland-chaparral, caves and mines.	Possible
Hoary bat	<i>Lasiurus cinereus</i>	G5/S4	Shrublands, grasslands, and aspen-pine forests near roosting habitat (deciduous trees).	Possible
Long-eared myotis	<i>Myotis evotis</i>	G5/S1B, S1N, NSS2	Conifer and deciduous forests, caves and mines.	Unlikely
Ringtail	<i>Bassariscus astutus</i>	G5/S1	Near water, dense riparian, conifer, pinyon-juniper, deserts, shrubsteppe.	Unlikely
Silver-haired bat	<i>Lasionycteris noctivagans</i>	G5/S3	Wide variety of habitats Roosts: trees, caves, mines.	Unlikely

Common Name	Scientific Name	Sensitivity Status ¹	Habitat	Occurrence Potential ²
Swift fox	<i>Vulpes velox</i>	R2, G3/S2A3	Grasslands.	Possible
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	R2/R4, G4/S1B, S2N, NSS2	Forests, basin-prairie shrub, caves and mines.	Possible
Western small-footed myotis	<i>Myotis ciliolabrum</i>	G5/S3	Montane forests, sage steppes, and shortgrass prairie Roosts: caves, mines.	Unlikely
White-tailed prairie dog	<i>Cynomys leucurus</i>	G4/S2S3, NSS3	Basin-prairie shrub, grasslands.	Present
Wyoming ground squirrel	<i>Spermophilus elegans</i>	G5/S3S4	Open habitats from sage grasslands to alpine meadows.	Possible
Wyoming pocket gopher	<i>Thomomys clusius</i>	R2, G2/S1S2, NSS4	Meadows with loose soil.	Possible
Birds				
American avocet	<i>Recurvirostra americana</i>	G5/S3B	Marshes, ponds, and shores, esp. alkaline areas.	Unlikely
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	G5/S3B	Juniper woodlands.	Unlikely
Baird's sparrow	<i>Ammodramus bairdii</i>	G4/S1B, SZN, FSR2, TBNG	Grasslands, weedy fields.	Possible
Black-throated gray warbler	<i>Dendroica nigrescens</i>	G5/S2	Juniper woodlands.	Unlikely
Brewer's sparrow	<i>Spizella breweri</i>	G5/S3B, SZN	Basin-prairie shrub.	Present
Burrowing owl	<i>Athene cunicularia</i>	R2, G4/S3B, SZN, NSS4	Grasslands, basin-prairie shrub.	Likely
Canyon wren	<i>Catherpes mexicanus</i>	G5/S2S3	Rocky canyons and cliffs.	Unlikely
Chestnut-collared longspur	<i>Calcarius ornatus</i>	G5/S1	Medium height grass, especially meadows around ponds.	Possible
Columbian sharp-tailed grouse	<i>Tympanuchus phasianellus columbianus</i>	G4T3/S1	Brushy areas in prairie country or foothills.	Likely

Common Name	Scientific Name	Sensitivity Status ¹	Habitat	Occurrence Potential ²
Ferruginous hawk	<i>Buteo regalis</i>	R2, G4/S3B, S3N, NSS3	Basin-prairie shrub, grassland, rock outcrops.	Present
Golden eagle	<i>Aquila chrysaetos</i>	G5/S3B	Open grasslands and shrublands especially around cliffs and canyons.	Likely
Greater sage-grouse	<i>Centrocercus urophasianus</i>	G5/S3	Basin-prairie shrub, mountain foothill shrub.	Present
Juniper titmouse	<i>Baeolophus ridgwayi</i>	G5/S1	Juniper woodlands.	Unlikely
Loggerhead shrike	<i>Lanius ludovicianus</i>	G5/S4B, SZN, R2	Basin-prairie shrub, mountain foothill shrub.	Likely
Long-billed curlew	<i>Numenius americanus</i>	G5/S3B, SZN, R2, NSS3	Grasslands, plains, foothills, wet meadows.	Possible
Merlin	<i>Falco columbarius</i>	G5/S4	Open woodlands, grasslands, and shrublands, sometimes in cities in winter.	Possible
Mountain Plover	<i>Charadrius montanus</i>	G2/S2B, SZN	Sparse shortgrass or mixed grass prairie. Also in short sagebrush plains. Often associated with prairie dog towns.	Likely
Northern goshawk	<i>Accipiter gentiles</i>	R2/R4, G5/S23B, S4N, NSS4	Conifer and deciduous forests.	Unlikely
Peregrine falcon	<i>Falco peregrinus</i>	G4/T3/S1B, S2N, R2, NSS3	Tall cliffs.	Possible
Sage sparrow	<i>Amphispiza belli</i>	G5/S3B, SZN	Basin-prairie shrub, mountain foothill shrub.	Present
Sage thrasher	<i>Oreoscoptes montanus</i>	G5/S3B, SZN	Basin-prairie shrub, mountain-foothill shrub.	Present
Sandhill crane	<i>Grus canadensis</i>	G5/S3B, S5N	Meadows, marshes, shorelines, and grain fields.	Possible
Scott's oriole	<i>Icterus parisorum</i>	G5/S1	Juniper woodlands.	Unlikely

Common Name	Scientific Name	Sensitivity Status ¹	Habitat	Occurrence Potential ²
Short-eared owl	<i>Asio flammeus</i>	G5/S2	Open grasslands, meadows, marshes, and farmland, especially around tall grass or weeds.	Possible
Snowy plover	<i>Charadrius alexandrinus</i>	G4/SA	Sandy beaches and shores of alkaline ponds.	Unlikely
Trumpeter swan	<i>Cygnus buccinator</i>	R2/R4, G4/S1B, S2N, NSS2	Lakes, ponds, rivers.	Unlikely
Western scrub-jay	<i>Aphelocoma californica</i>	G5/S1	Juniper woodlands.	Unlikely
White-faced ibis	<i>Plegadis chihi</i>	G5/S1B, SZN, R2, NSS3	Marshes, wet-meadows.	Unlikely
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	G5/S2B, SZN, FSR2, TBNG, NSS2	Open woodlands, streamside willow and alder groves.	Unlikely
Amphibians				
Boreal toad	<i>Bufo boreas boreas</i>	G4T4/S2, R2, R4, NSS2	Pond margins, wet meadows, riparian areas.	Unlikely
Great Basin spadefoot toad	<i>Spea intermontanus</i>	G5/S4, NSS4	Spring seeps, permanent and temporary waters.	Unlikely
Northern leopard frog	<i>Rana pipiens</i>	G5/S3, R2, NSS4	Beaver ponds, permanent water in plains and foothills.	Unlikely
Tiger salamander	<i>Ambystoma tigrinum</i>	G5/S4	Fairly moist environments ranging from rodent burrows, window wells, to burrows in sand dunes. Larvae found in intermittent streams, ponds, and lakes.	Unlikely

Common Name	Scientific Name	Sensitivity Status ¹	Habitat	Occurrence Potential ²
Reptiles				
Northern many-lined skink	<i>Eumeces multivirgatus</i>	G5/S1	Grassland communities or open scarp woodlands, on the ground and often hiding under loose objects (boards, logs, rocks, etc.).	Possible
Northern plateau lizard	<i>Sceloporus undulates elongtus</i>	G5T5/S1	Near rocky outcrops and canyon walls in sagebrush communities, in association with the sagebrush lizard.	Likely
Fish				
Bluehead sucker	<i>Catostomus discobolus</i>	G4/S2S3, NSS1	Bear, Snake and Green drainages, all waters.	Unlikely
Colorado River cutthroat trout	<i>Oncorhynchus clarki pleuriticus</i>	R2/R4, G4T2T3/S2, NSS2	CO River drainage, clear mountain streams.	Unlikely
Flannelmouth sucker	<i>Catostomus latipinnis</i>	G3G4/S3, NSS1	CO River drainage, large rivers, streams and lakes.	Unlikely
Roundtail chub	<i>Gila robusta</i>	G2G3/S2?, NSS1	CO River drainage, mostly large rivers, also streams and lakes.	Unlikely

Sources: USDI-BLM (2002), WYNDD (2005).

Notes:

¹ Definition of status:

G Global rank: Rank refers to the range-wide status of a species.

T Trinomial rank: Rank refers to the range-wide status of a subspecies or variety.

S State rank: Rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.

1 Critically imperiled because of extreme rarity (often known from five or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.

2 Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.

3 Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).

4 Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.

5 Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.

H Known only from historical records. 1950 is the cutoff for plants; 1970 is the cutoff date for animals.

X Believed to be extinct.

- A Accidental or vagrant: A taxon that is not known to regularly breed in the state or which appears very infrequently (typically refers to birds and bats).*
- B Breeding rank: A state rank modifier indicating the status of a migratory species during the breeding season (used mostly for migratory birds and bats)*
- N Nonbreeding rank: A state rank modifier indicating the status of a migratory species during the non-breeding season (used mostly for migratory birds and bats)*
- ZN or ZB Taxa that are not of significant concern in Wyoming during breeding (ZB) or non-breeding (ZN) seasons. Such taxa often are not encountered in the same locations from year to year.*
- U Possibly in peril, but status uncertain; more information is needed.*
- Q Questions exist regarding the taxonomic validity of a species, subspecies, or variety.*
- ? Questions exist regarding the assigned G, T, or S rank of a taxon.*
- R2 Designated sensitive in U.S. Forest Service Region 2 (Rocky Mountain Region).*
- R4 Designated sensitive in U.S. Forest Service Region 4 (Intermountain Region).*

WGFD Native Species Status Codes - Fish and Amphibians

- NSS1 Populations are physically isolated and/or exist at extremely low densities throughout range. Habitats are declining or vulnerable. Extirpation appears possible. The Wyoming Game and Fish Commission mitigation category for Status 1 species is "Vital." The mitigation objective for this resource category is to realize "no loss of habitat function." Under these guidelines, it will be very important that the project be conducted in a manner that avoids alteration of habitat function.*
- NSS2 Populations are physically isolated and/or exist at extremely low densities throughout range. Habitat conditions appear to be stable. The Wyoming Game and Fish Commission mitigation category for Status 2 species is also "Vital." The mitigation objective for this resource category is to realize "no loss of habitat function." Under these guidelines, it will be very important that the project be conducted in a manner that avoids alteration of habitat function.*
- NSS3 Populations are widely distributed throughout its native range and appear stable. However, habitats are declining or vulnerable. The Wyoming Game and Fish Commission mitigation category for Status 3 species is "High." The mitigation objective for this resource category is to realize "no net loss of habitat function within the biological community which encompasses the project site." Under these guidelines, it will be important that the project be conducted in a manner that either avoids the impact, enhances similar habitat or results in the creation of an equal amount of similarly valued fishery habitat.*
- NSS4-7 Populations are widely distributed throughout native range and are stable or expanding. Habitats are also stable. There is no special concern for these species.*

WGFD Native Species Status Codes - Birds and Mammals

- NSS1 Populations are greatly restricted or declining, extirpation appears possible. On-going significant loss of habitat.*
- NSS2 Populations are declining, extirpation appears possible; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance. OR Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; ongoing significant loss of habitat.*
- NSS3 Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance. OR Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance. OR Species is widely distributed; population status or trends are unknown but are suspected to be stable; on-going significant loss of habitat.*
- NSS4 Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance. OR Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance.*

NSS5 Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is stable and not restricted. OR Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance.

NSS6 Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is stable and not restricted.

NSS7 Populations are stable or increasing and not restricted in numbers and/or distribution; habitat is stable and not restricted.

² *Occurrence potential based upon presence of suitable habitat, known distribution, WYNDD records, WGFD records, and field surveys.*

3.9 RECREATION

Hunting is the primary recreational use of the BCII PA, with secondary use of the lands for pleasure driving and wildlife viewing. There are no official counts of recreational visitors; however, overall use is believed to be low, which may be attributed to low population densities in the BCII PA vicinity. Additionally, low visitation may be related to the lack of high-standard roads in the area. Road improvements associated with the BCII development may increase visitation.

Based on observations by the BLM, it has been determined that recreational use in the BCII PA appears to be steady or on a slight upward trend. Currently, wildlife populations and habitat conditions are favorable for hunting. The number of hunters in the area is limited by the number of hunting licenses available from the WGFD, which depends largely on herd size as compared to target herd size. If herd size declines, so would the number of licenses issued and, correspondingly, hunting pressure.

3.9.1 Hunting

Recreation visitation in the BCII PA occurs primarily during the fall hunting season (September through November). Big game species are found throughout the BCII PA. While most hunters in the BCII PA pursue mule deer, pronghorn, and elk, some sage-grouse and cottontail rabbit hunting also occurs. Rabbit and predator hunting occurs in late fall and winter. Hunting is of local importance as many regional hunters find the BCII PA to be a convenient and economical area to pursue their sport. The area has also gained national recognition for the high-quality big game hunting and many out-of-state hunters find the BCII PA appealing because they are able to hunt multiple big game species from a single camp site.

Due to the lack of water bodies, sport fishing and waterfowl hunting are not conducted within the BCII PA.

3.9.2 Other Recreation

During spring and summer, small numbers of visitors participate in rock collecting, camping, hiking, wildlife observation, outdoor photography, picnicking, pleasure driving, and off-road vehicle use. Pleasure driving occurs seasonally. Wildlife viewing occurs primarily during the fawning season in late May and June. Raptors, sage-grouse, and other birds attract bird watchers. Rock collecting generates a small amount of use. Other recreational activities within

the BCII PA such as camping and off-road vehicle use are often associated with hunting and scouting activities.

The BLM (2000) considers the overall level of recreation use as low, which is attributed to a low number of local residents, distance from major population centers, lack of publicized natural attractions, and poor road conditions into back-country areas. There are no developed recreational facilities within or adjacent to the BCII PA.

3.10 VISUAL RESOURCES

The landscape in the BCII PA is characterized by undulating topography, ranging from 6,600 feet to over 7,000 feet, and numerous small drainages. Panoramic views from Wild Horse Butte and features such as Cherokee Creek, Wild Horse Basin, and numerous springs and basins make the BCII PA visually unique. Typical plant communities in cold deserts include alkali and low sage brush, mixed desert scrub, and grasses and forbs with scattered patches of big sage/rabbit brush on flatter north and east facing slopes, along drainage ways, and in large depressions. These communities create a green and gray-green color palette in early spring which changes to gray-green and buff/ochre in the summer as grasses and forbs cure. The reddish-brown and earth tones of the surrounding geologic formations creates a contrasting background and dominates the color-scape in areas of steep topography. Human presence is evident due to roads, power lines, and oil and gas production facilities throughout the landscape of the BCII PA.

Due to a viewing distance of three to six miles and rolling topography, there is a limited view of the project area from SH 789. Any facilities or activities located on ridge lines or buttes would be visible from an extensive distance. All visitors would be affected by changes to the visual resources.

The BLM's VRM program is responsible for the management of BCII's visual resources. The intent of the VRM program is to preserve scenic values while facilitating resource development where it is appropriate. The BCII PA has been classified by the BLM visual resource management personnel as VRM Class III. The level of change to visual resources allowable within Class III is described in the BLM Manual 8431—Visual Resource Contrast Rating, Appendix 2 – VRM Management Class Objectives. The objective within Class III areas is to partially retain the existing character of the landscape. The level of change allowed in Class III areas to a characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

To maintain VRM Class III standards, BCII facilities would be constructed in a manner that reflects the lines, forms, colors, and textures of the characteristic landscape, so as to not dominate the landscape. Whenever feasible, existing topography and vegetation would be utilized to screen project activities and facilities.

3.11 CULTURAL RESOURCES

3.11.1 Cultural Chronology of Area

Archeological investigations in the Washakie Basin have concluded that the area has been inhabited by humans for at least 10,000 years from the Paleoindian occupation to the present. The accepted cultural chronology of the Washakie Basin is based on a model for the Wyoming

Basin by Metcalf (1987) and revised by Thompson and Pastor (1995). The Wyoming Basin Chronology is documented in **Table 3-16**.

Table 3-16
Prehistoric Chronology of the Wyoming Basin

Period	Phase	Age (B.P.)
Paleoindian		12,000 – 8,500
Early Archaic	Great Divide	8,500 – 6,500
	Opal	6,500 – 4,300
Late Archaic	Pine Spring	4,300 – 2,800
	Deadman Wash	2,800-2,000/1,800
Late Prehistoric	Uinta	2,000/1,800 – 650
	Firehole	650 – 300/250
Protohistoric		300/250 – 150 A.D.

Paleoindian Period

The oldest period for which there is solid archaeological evidence is the Paleoindian, beginning ca. 12,000 years B.P. and ending around 8,500 B.P. This is the transition period from the periglacial conditions of the Wisconsin ice advance during the terminal Pleistocene to the warmer and drier climatic conditions of the Holocene. Paleoindian sites are rare in southwest Wyoming. However, isolated surface finds of Paleoindian projectile points are not uncommon and suggest that site preservation may be a major factor affecting the number of known sites.

Archaic Period

Settlement and subsistence practices in southwest Wyoming remained largely unchanged from the end of the Paleoindian period through the Archaic and continued until at least the introduction of the horse, or even until Historic Contact. Reduced precipitation and warmer temperatures occurred ca. 8,500 B.P. The environmental change at the end of the Paleoindian period led to a pattern of broad spectrum resource exploitation which is reflected in the subsistence and settlement practices of the Archaic period which became more diverse. The Archaic period is divided into the Early and the Late periods and subdivided in the Great Divide and Opal and the Pine Spring and Deadman Wash phases, respectively. Large side- and corner-notched dart points were used for hunting. The presence of ground stone implements suggests a greater use of plant resources during the Archaic.

Late Prehistoric Period

The Late Prehistoric period lies between 2,000/1,800 B.P. and 300/250 B.P. and is subdivided into the Uinta and the Firehole phases. Large-scale seed processing and an increase in the number of features is noted in the Late Prehistoric period as is the presence of pottery and the introduction of the bow and arrow technology. A characteristic of the Uinta phase is clusters of semi-subterranean structures dating to ca. 1,050 B.P.

3.11.2 Excavation Data

A cultural resources survey was conducted by Western Archaeological Services, Inc. between May and October 2005. Surveys were conducted at the proposed exploratory well pad sites; however, no surveys have yet been conducted at the proposed injection well sites. Cultural resources were found at two proposed well pad sites and all but one of the proposed well pad sites is within the Cherokee Trail viewshed. Please see **Table 3-17** for a summary of the survey findings.

Table 3-17
Summary of Cultural Resources Survey

Well Pad	Survey Date	Findings
AR Federal 1491 15-11	5/10/05	No resources present. Cherokee Trail 1.5 miles north in viewshed.
AR Federal 1491 11-11	5/10/05	No resources present. Cherokee Trail 1.5 miles north in viewshed.
AR Federal 1491 7-11	5/16/05 and 10/17/05	No resources present. Cherokee Trail one mile north in viewshed.
AR Federal 1491 3-14	5/10/05	No resources present. Cherokee Trail 1.5 miles northeast in viewshed.
AR Federal 1491 7-14	5/10/05	No resources present. Cherokee Trail 1.5 miles northeast in viewshed.
AR Federal 1491 1-14	5/16/05	No resources present. Cherokee Trail 1.5 miles northeast in viewshed.
AR Federal 1491 15-2	8/30/05	No resources present. Cherokee Trail one mile northeast in viewshed.
AR Federal 1491 13-11	8/30/05	No resources present. Cherokee Trail one mile northeast in viewshed.
AR Federal 1491 9-11	5/16/05	Small modern sheepherder camp located on access road. No historic artifacts are present. Cherokee Trail one mile northeast in viewshed.
AR Federal 1491 1-11	8/30/05	No resources present. Cherokee Trail 0.5 mile northeast in viewshed.
AR Federal 1491 11-2	8/31/05	Access road crosses the Cherokee Trail. No other historic properties present.
AR Federal 1491 9-14	5/10/05	Cherokee Trail 1.5 miles northeast of project area but out of the viewshed.

3.11.3 Historic Sites

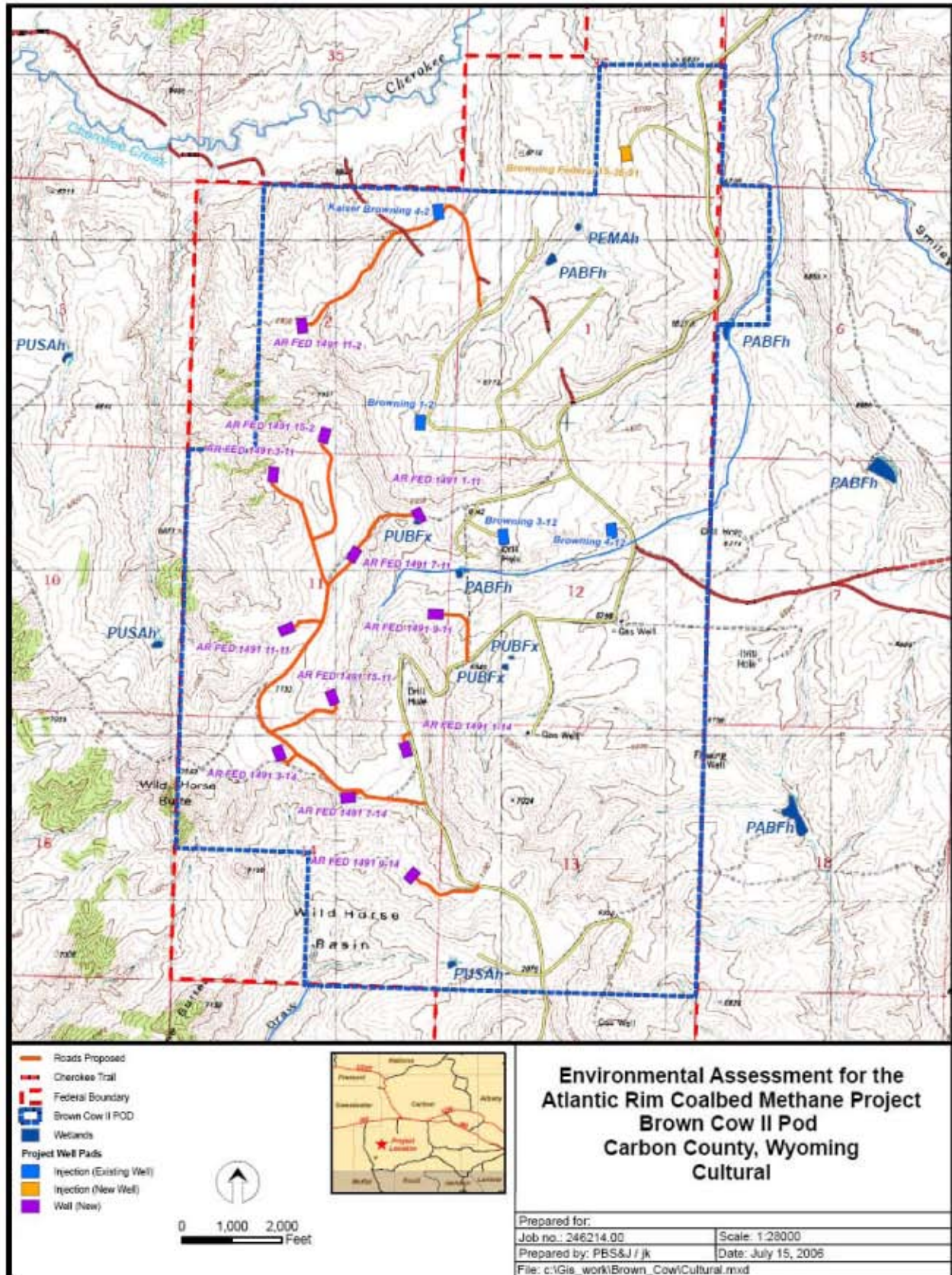
The Cherokee Trail (48SW3680/48CR3651) crosses the northeastern portion of the BCII PA and **Figure 3-11** shows the general location of the Cherokee Trail within the BCII PA. The Cherokee Trail was used by the Cherokee tribe in the 1850s to move from the Oklahoma

Reservation to the California gold fields. From 1851 to 1900 travel along the trail was fully documented by diaries, letters, newspaper accounts, and military and congressional records. The Cherokee Trail provided a north-south corridor for southern frontier states emigrant traffic (Fletcher). A prehistoric sheep herder camp was identified within the BCII PA, which alludes to the historic and prehistoric use of the BCII PA by sheep herders. The identified prehistoric camp site was determined to be not eligible for listing in the National Register of Historic Places.

“The Cherokee Trail has received a great deal of attention by writers as well as the film industry. Louis L’Amour romanticized the trail in his novel *The Cherokee Trail*. And in the 1960s a television series entitled “Cherokee Trail” drew attention to this road through southern Wyoming. The net result of the combined effort of novelists, historians, and the media has been to create a highly romanticized trail that is still not well understood in terms of the people who traveled this trail and the location of the actual route of this road taken by Cherokees traveling west from Oklahoma to California in 1850” (Gardner 1999).

The Cherokee Trail is recommended as eligible for inclusion on the NRHP. As with many historic linear properties, variations have been documented. Inaccessibility at certain times of the year or members of the group finding an easier or more direct avenue to water are possible causes for these variations.

Figure 3-11
Cherokee Trail



3.12 SOCIOECONOMICS

The geographic area of analysis for potential socioeconomic effects is Carbon County, Wyoming, and the nearest communities of Baggs, Dixon, and Rawlins. Socioeconomic conditions in Carbon County that were characterized for the assessment include economic and population conditions, temporary housing resources, certain local and State government revenues, and local attitudes and opinions.

3.12.1 Economic Conditions

The economy of Carbon County is based on natural resources. Basic economic sectors that bring revenues in the county include: oil and gas extraction and processing, coal mining, electric power generation, agriculture (primarily ranching and logging), some manufacturing, and transportation (primarily the Union Pacific railroad). Those portions of the retail and service sectors that serve tourism and recreation visitors are also basic.

Employment and earnings are two common measures of economic activity. The mining sector, which includes oil and gas employment, would be the primary sector affected by exploration or development of CBNG resources.

Employment, like the overall economy, has followed a boom and bust cycle. In 2002, employment in Carbon County totaled 12,392 full- and part-time jobs, which was about 25% higher than the 1990 level (Wyoming Department of Administration and Information [WDAI] 2000a, WDAI 2003) and about 9% lower than the 1980 level of 13,350 jobs. Employment in the mining sector, which includes jobs in the oil and gas industry, decreased 73% from 1990 to 2001, from 934 jobs to 256 jobs. The 2001 level was 93% lower than the 1980 level of 3,563 mining jobs (University of Wyoming [UW] 1997). The losses in the mining sector and the volatility in total employment are attributed to the shutdown of the Rosebud and Seminole #2 mines (BLM 1999). Recently, the RAG Shoshone mine near Hanna closed (Rawlins Daily Times 2000). Other reductions in the mine workforce and the delay in opening an anticipated mine have further affected employment in the mining sector throughout the County; however, increases in natural gas drilling has resulted in employment growth in the region in recent years.

In Carbon County, 10-year unemployment rates ranged from a low of 4% in 2000 to a high of 6.1% in 1993. The total 2002 labor force in Carbon County was 8,038, which included 366 unemployed persons, resulting in an unemployment rate of 4.6% (Wyoming Department of Employment 2003).

Carbon County tax earnings increased from \$202 million to \$211 million between 1990 and 1998, a 5% increase. However, when adjusted for inflation, earnings in Carbon County decreased by 21% from their 1990 level during the eight-year period.

3.12.1.1 Oil and Gas Activities

Production of natural gas in Carbon County increased from approximately 76 million cubic feet in 1995 to approximately 98 million cubic feet in 2002. In addition, 2002 production of oil in Carbon County was 1,714,000 bbls. During 2002, there were 1,191 producing oil and gas wells in Carbon County (WOGCC 2002).

One indicator of future production, approved APDs, increased steadily in Carbon County in recent years, from 50 in 1995, to 162 in 2000, to 280 in 2003, to 330 in 2004, and then dropping slightly to 283 in 2005 (WOGCC 2006). Increased drilling may result in increased production in the County if drilling efforts are successful and commodity prices rise or stabilize at economic levels.

3.12.1.2 Economic Activities

Other economic activities occurring in and near the BCII PA include: oil and gas exploration, cattle grazing, outdoor recreation such as hunting (pronghorn antelope, mule deer, elk, and upland birds), hiking, off-road vehicle use, camping, and sightseeing. There are 19 commercial hunting outfitters that hold permits for the hunting units (elk hunt Area 108, deer hunt Area 82, and antelope hunt Area 55) located in the BCII PA, which comprises only a small portion of the hunting units (Wyoming Board of Outfitters 2006).

3.12.1.3 Population

The growth and decline in the population of Carbon County parallel the employment boom and bust cycle outlined at the beginning of the socioeconomics section. For example, the 2000 population of Carbon County (15,639) was 29% lower than its 1980 level of 21,896 (WDAI 2001). Between 1990 and 2000, the City of Rawlins, the largest community in Carbon County, lost an estimated 842 persons to end the period at 8,538 (see **Table 3-18**). However, the city has recently added population because a new State prison opened. During this period, the Town of Baggs gained 76 residents, or 28% of its 1990 population. Likewise, the Town of Dixon, several miles east of Baggs, gained 12 persons to end the period with an estimated population of 79. The largest population centers in Carbon County are listed in **Table 3-18**.

Table 3-18
Population Centers

County	City	Population 1990	Population 2000	% Change
Carbon	Rawlins	9,380	8,538	-9.0
	Saratoga	1,969	1,726	-12

Source: WDAI 2001.

3.12.2 Temporary Housing Resources

Natural gas development typically involves relatively short-duration tasks carried out primarily by contractors. The nature of these activities results in demand for temporary housing resources such as motel rooms, mobile homes, and recreational vehicle (RV) spaces in the BCII PA and vicinity.

The most convenient access to the BCII PA would be from the communities located along Interstate Highway (IH) 80 in Carbon and Sweetwater Counties. Rawlins is the county seat of Carbon County and the community nearest the BCII PA. Temporary housing includes 19 motels and four RV parks. Motels and RV parks routinely accommodate oil and gas industry workers, as well as tourists, travelers, and hunters. Long-term rental housing in the Rawlins area consists

of 10 apartment complexes and numerous rental houses. According to the 2000 Census, 17.3%, or 667 housing units, of the total 3,860 housing units were rental vacancies.

3.12.3 Local Government and State Government Revenues

The fiscal condition of local and State governments most likely to be affected by interim drilling includes: County, school, and special district ad valorem property tax revenues; State, County, and municipal sales and use tax revenues; State severance taxes; and Federal and State mineral royalty distributions. Some County, municipal, and special district service expenditures may also be minimally affected.

3.12.3.1 Ad Valorem Property Tax

The assessed valuation in Carbon County for fiscal year (FY) 2005 totaled \$667.9 million, which yielded total property tax revenues of \$41.8 million (WTA 2005). Mineral production is assessed at 100% of value. The countywide mill levy (including countywide and special districts) in 2003 was \$4.9 million. Assessed valuation in FY 2005 from 2004 natural gas production totaled \$447.1 million, or about 88% of total assessed valuation. Assessed valuation from oil production totaled \$56.4 million, or about 13% of total assessed valuation (WDAI 2005).

3.12.3.2 Sales and Use Tax

FY 2005 sales and use tax collections in Carbon County totaled \$24.5 million. These collections include a 4% State sales tax and a 1% general purpose local-option sales tax. In addition, Carbon County opted to impose a 1% specific purpose option sales tax during FY 2005 (WDAI 2005).

3.12.3.3 Severance Taxes

In Wyoming, severance taxes are levied against certain minerals produced in the State, including a 6% severance tax on natural gas. In FY 2003, distributions from the severance tax totaled \$429 million (WDAI 2004).

3.12.3.4 Federal Mineral Royalties

The Federal government collects a 12.5% royalty on oil and natural gas extracted from Federal lands. After certain costs are deducted, half of those royalties are returned to the state where production occurred. In Wyoming, the State's share is distributed to a variety of accounts, including the university, school foundation fund, highway fund, Legislative Royalty Impact Account, and cities, towns, and counties. During FY 2003, \$476 million in Federal mineral royalty funds were distributed to entities in Wyoming (WDAI 2004).

3.12.3.5 State Mineral Royalties

The State of Wyoming collects a 16.7% royalty on the fair market value of gas produced from State leases, less production and transportation costs. During FY 2003, income from State leasing was \$52 million (WDAI 2004).

3.12.4 Attitudes and Opinions

A 1996 survey conducted in conjunction with the preparation of the Carbon County Land Use Plan provides some insight into the attitudes and opinions of residents regarding land use, oil and gas development, natural resource conservation and use, and other topics. Slightly more than 300 residents completed the survey, yielding an estimated statistical reliability of about 95% (Pederson Planning Consultants 1998). Water resource conservation and concern for government regulation of land use were the most frequently listed important land use issues. This issue was followed closely by the availability of water to support future land uses; the economic viability of ranching, timber, and oil and gas industries; and the need to conserve wildlife habitat.

Approximately 55% of the countywide survey respondents (based on a weighted average; some respondents indicated more than one response) indicated that conservation of land, water, and wildlife resources was more important than increased oil and gas production, while 36.9% indicated that increased oil and gas production was more important. However, 54% of the respondents from the Town of Baggs indicated that increased oil and gas production was more important than conservation of land, water, and wildlife resources, while 36% indicated that resource conservation was more important. The Carbon County Land Use Plan attributes the difference to the greater economic dependence in the Town of Baggs on future employment in the oil and gas industry.

Concerning management of Federal lands, the largest number of respondents (69.5%) indicated that more Federal lands within the County should be designated for conserving fish and wildlife habitat and water resources. In addition, 60.8% of respondents indicated that more land should be designated for public recreation, 48.8% indicated that more land should be leased for oil and gas industry exploration and production, 48.7% indicated that more land should be leased for commercial mining, and 44.5% indicated that more land should be made available to local timber companies for commercial timber harvest.

3.13 TRANSPORTATION

The regional transportation system that serves the BCII PA includes an established network of Interstate and State Highways as well as County Roads. Improved and unimproved BLM roads serve local traffic on Federal land. IH 80 runs from east to west, north of the BCII PA. The BCII PA is accessible from Baggs, Wyoming by traveling approximately 7.5 miles north on SH 789.

3.14 HEALTH AND SAFETY

Some health and safety concerns exist at the BCII PA. Inherent occupational hazards are associated with oil and gas exploration and operation and there are safety issues associated with vehicular travel on unimproved County and BLM roads. The primary recreational activity in the project area is hunting; therefore, there are risks of injury due to firearm accidents. Additionally, there is a low probability of events such as landslides, flash floods, and range fires.

3.15 HAZARDOUS OR SOLID WASTE

According to the BLM's Instruction Memoranda Number WO-93-344, all NEPA documents are required to list any hazardous and/or extremely hazardous materials that would be produced,

used, stored, transported, or disposed of as a result of a proposed action. A list of hazardous materials can be found in the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of the SARA of 1986. Extremely hazardous materials are those identified in the EPA's List of Extremely Hazardous Substances (40 CFR 355).

The EPA has developed the Enviromapper, which is a tool that utilizes interactive maps to map, display, and query National Priorities List (NPL) sites. The NPL is a database of the sites containing the most threatening releases of contaminants, hazardous substances, or pollutants in the United States. According to the EPA's Enviromapper, there are no NPL sites within the BCII PA. No hazardous or extremely hazardous materials would be used in the construction or drilling of the wells at the BCII PA and no RCRA hazardous wastes would be generated by the operation of the wells.

3.16 NOISE

The BCII PA is located in a rural setting, which is sparsely populated. The only noise created above normal background levels is from nearby drilling, a compressor station, and localized vehicular traffic. Roads in the area can also cause sound disturbances within the BCII PA.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter analyzes the potential environmental consequences that would result from implementation of the Proposed Action and the No-Action Alternative. The analysis of environmental consequences for each resource potentially affected by exploration and interim development in the 3,692-acre BCII PA are addressed in this chapter, which also addresses cumulative impacts that may result from past, present, and reasonably foreseeable future activities within the BCII PA.

An environmental consequence, or impact, is defined as a change or modification in the existing environmental conditions resulting from implementation of the Proposed Action. Impacts can result directly from the Proposed Action, or can be a secondary or indirect result of the Proposed Action. Additionally, impacts can vary in the duration they affect the environment; they can be permanent or long lasting (long-term) or temporary (short-term).

Short-term impacts normally occur during the construction and start-up phases of the project. These impacts usually last two years or less and can be mitigated successfully if proper management is applied. Long-term impacts are changes to the affected environment occurring during construction or operation of the project that last longer than two years and potentially for the life of the project or beyond.

Construction of the proposed BCII facilities would occur within the existing Brown Cow/Browning Field development. The Browning Field is a historic oil field comprised of 14 producing oil wells and associated infrastructure (i.e. access roads, flowlines, produced water lines, water injection wells, and compressor station). The Brown Cow I project was constructed in 2005 and consisted of 12 coalbed methane wells encompassing a total of 12.6 acres. In addition to the well pads established during these operations, associated access roads (5.8 acres), gas gathering and water disposal pipelines (18.8 acres), injection wells (1.0 acre), and a pumping station (0.7 acre) were constructed. Also, a total of 4,023 feet of existing roadway were upgraded in conjunction with the Brown Cow I construction.

4.2 GEOLOGY, MINERALS, AND PALEONTOLOGY

4.2.1 Alternative 1 – Proposed Action

Construction of the proposed wells and associated facilities would result in the disturbance of soils and vegetation that could increase the probability of altering slopes and other topographical features in the BCII PA. If surface features are altered, this could increase the potential for erosion and mass movement of earth materials. Approximately 78.1 acres of short-term impacts and 20.8 acres of long-term impacts would occur by surface-disturbing activities in the BCII PA.

Mass movement of earth materials is the greatest geologic hazard threat in the BCII PA. The surface geologic formations within the BCII PA, the Lewis and Lance Formations, contain shale beds that are prone to mass movement. They are most susceptible to movement along the western side of their exposure where removal or erosion has weakened the formation. Disturbance of these sites could result in landslides, slumping, creep, and earth flowage. Avoidance of shale formations would limit the possibility of this geologic hazard and impacts to

geology and geologic hazards would be reduced by implementing the mitigation measures described in Chapter 2.

Mineral development in the BCII PA has been limited to natural gas and oil. No other economically important mineral resources have been located within the BCII PA. Full field development and the resulting production of CBNG in the BCII PA could result in depletion of these reserves.

Construction of well pads, access roads, and the excavation of pipeline and utility line trenches could result in the exposure and potential damage of fossil resources. However, there is a possibility of new fossil resources being discovered, properly recovered, and transferred to a museum repository where they would be available for study.

There is no record of fossil locations in the BCII PA. However, Lewis shale, which has been documented to contain large amounts of fossil material in other areas, is widely distributed in the BCII PA, and represents a potential source of fossils. Potential impacts to paleontological resources would be diminished by implementing the mitigation measures described in Chapter 2.

4.2.2 No-Action Alternative

Under the No-Action Alternative, ongoing natural gas production activities would be allowed to continue; however, no exploratory wells would be authorized in the BCII PA. Therefore, no impacts to geology, minerals, and paleontological resources are expected.

4.3 AIR QUALITY

4.3.1 Alternative 1 – Proposed Action

Small air quality impacts would result from pollutants emitted during construction, including fugitive dust generated from earth moving equipment and vehicles, well drilling and completion, and engine exhaust; as well as from production activities, including emissions from natural gas wells, engine exhaust, and fugitive dust. Pollutants emitted during these activities would include NO_x, CO, SO₂, PM₁₀, PM_{2.5}, volatile organic compounds, and HAPs (e.g. benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde).

Temporary effects to air quality in the immediate vicinity of the BCII PA would occur from construction activities. However, based on the small number of exploratory wells present in the BCII PA, emissions would be low. These pollutants would be comprised of particulate matter and exhaust originating from vehicles and earth moving equipment. Construction emissions would be temporary, lasting only for the duration of construction activities.

Production emissions would occur for the life of the project. The amount of air pollutant emissions is controlled by the best available control technology regulations implemented by the WDEQ-AQD. Air pollutant emissions have been recently analyzed by the BLM for the ARPA during preparation of the Atlantic Rim EIS. This air quality analysis conducted detailed modeling for 2,000 proposed wells being planned in the ARPA. The modeling was conducted for both near-field and far-field impacts and modeling results indicated near-field air emission impacts would be less than NAAQS and WAAQS (BLM 2005). Far-field concentrations would be below all applicable NAAQS, WAAQS, CAAQS, and PSD increments. Direct visibility

impacts would be below the 1.0 dv (“just noticeable visibility change”) for all sensitive Wilderness Areas. Additionally, the maximum sulfur and nitrogen deposition potential resulting from ARPA production sources are below the 0.005 kg/ha-yr DAT for all of the sensitive PSD Class I and II areas analyzed in the Atlantic Rim EIS. All of the acid sensitive lakes analyzed in the EIS showed the ANC change would be less than the LAC from project area emission sources.

The emissions associated with the proposed project would be similar to other natural gas projects in Wyoming but, due to the small size of the project (only 12 production wells and one compressor station), emissions would be on a much smaller scale. Based on the low emissions, no ambient air quality standards would be violated and no substantial impacts to air quality would occur as a result of the proposed project. However, BCII PA emissions would contribute to regional emissions that reduce far-field visibility in Class I and II areas. This contribution would be negligible when compared with large regional emission sources.

4.3.2 No-Action Alternative

Under the No-Action Alternative, no new gas wells would be installed in the BCII PA. Therefore, no new emission sources would occur in the BCII PA.

4.4 SOILS

4.4.1 Impact Significance Criteria

The following criteria serve as a basis to assess the intensity, duration, and magnitude of potential soil impacts associated with implementation of the Proposed Action and Alternatives. Soil impacts would be significant given the following:

- Soil erosion is increased beyond two tons per year within five years of disturbance;
- Interim reclamation is not successful within three years of implementation;
- Water resources significance criteria are not met;
- Vegetation significance criteria are not met; or
- Soil productivity is reduced to a level that prevents the disturbed area from recovering to pre-disturbance soil/vegetation productivity levels.

4.4.2 Alternative 1 – Proposed Action

The proposed construction and operation of wells and facilities could affect the productivity of soils in the BCII PA by:

- Removing existing native vegetation cover;
- Redistributing or removing all or part of the topsoil profile, especially mixing this profile with higher salinity subsoils;
- Compaction of soils;
- Decreasing topsoil productivity;

- Exposing soil to accelerated wind and water erosion;
- Potentially covering adjacent soils and drainages with sediments;
- Exposing soil to noxious and invasive weed infestation; and
- Potential damage to sensitive biological soil crusts.

Proposed project activities would reduce soil productivity within and immediately adjacent to the areas of disturbance. The effects of these activities on soil productivity have been evaluated based on their duration, magnitude, and intensity. Both long-term and short-term effects on soil productivity would occur under the Proposed Action. Approximately 78.1 acres of soil would be affected in the short-term (two years or less) and 20.8 acres of soil would be affected in the long-term (greater than two years).

Vegetation and soil would be removed from areas where proposed well pads, compressor pads, discharge facilities, roads, and other facilities would be constructed. This soil and vegetation removal may result in erosion, as most of the soils present in the BCII PA exhibit the potential for moderate to severe erosion.

As a result of proposed construction activities, the productivity of soils could decline due to:

- Reduced soil microbial activity and soil fertility;
- Interruption of soil nutrient and organic matter from vegetation;
- Impaired water infiltration from soil compaction;
- Mixing of soil horizons and soils of differing chemistry/composition;
- Damage to sensitive biological crusts; and
- Topsoil loss.

The intensity of these effects would vary according to the type and location of disturbance, development and production activities, use of mitigation measures, and the length of disturbance prior to reclamation. To address these soil productivity issues, the Proponents have committed to implementing the mitigation measures described in Chapter 2. Efforts will be made to ensure compliance with these mitigation measures in an accurate and timely manner.

Following drilling, testing activities, and construction of the proposed facilities, the disturbed areas not required for production of natural gas would be reclaimed to BLM standards. Facility areas and roads would be regraded to blend the disturbed area into the surrounding topography. Regraded areas and redistributed soil would be scarified to alleviate compaction and seeded to reduce wind and water erosion. Measures to control erosion, runoff, and sedimentation during operations and reclamation are described in Chapter 2.

Biological soil crusts are very sensitive and easily damaged by off-road vehicle use. The use of project-related vehicles off of designated roads would be prohibited to prevent damage to biological soil crusts. This measure should ensure that negligible damage would occur to biological soil crusts potentially present in the BCII PA.

Overall impacts to soil resources in the BCII PA are anticipated to be low based on the following evaluation:

- Small area of proportional disturbance;
- Use of proper construction and reclamation techniques; and
- Implementation of the mitigation measures described in Chapter 2.

4.4.3 No-Action Alternative

Under the No-Action Alternative, none of the proposed activities would occur. Therefore, no new disturbance of soils from oil and gas exploration would occur.

4.5 WATER RESOURCES

4.5.1 Alternative 1 – Proposed Action

No effects on groundwater or surface water would be anticipated as a result of the proposed project with the use of proper construction techniques, drilling practices, proper operating procedures, and implementation of the mitigation measures described in Chapter 2.

Groundwater would be removed from the coal seam aquifers within the Mesaverde Group, which range in depth from 2,025 feet to 3,325 feet. Groundwater within the BCII PA is generally suitable for livestock use; however, it was deemed unsuitable for drinking due to elevated levels of iron, manganese, and TDS. Groundwater within the BCII PA is also unsuitable for agricultural use because of excess residual sodium carbonate.

The targeted coal seams are classified as confined to semi-confined aquifers because they are bounded by confining layers that consist of impervious to semi-pervious layers of shale and siltstone. Hydraulic connection between the coal seams and any aquifer stratigraphically above or below the coal seams is limited. Confined, or artesian, aquifer conditions of this type indicate an effective seal above and below the aquifer. However, lowering the hydraulic head in the coal seam aquifers by removing water may induce a slight leakage through the semi-pervious shale layers into the pumped aquifer. Because of the extremely low hydraulic conductivity of the confining layers and the limited number of new gas wells proposed (12), enhanced leakage from an aquifer stratigraphically above or below the affected coal seams would be small.

The proposed exploratory wells would produce water that would be disposed of in five deep injection wells. The depth of the injection wells, which would be completed in the Haystack Mountain Formation, is expected to be between 3,000 feet and 5,000 feet. The produced water that would be injected into these wells is of higher quality than the groundwater in these formations; therefore, the only effect on the injection horizons would consist of an increase in the hydraulic head emanating from the injection well, which would dissipate with distance from the wellbore. In terms of water quantity and quality, the effect of the Proposed Action on the injection horizon would be low.

Because water produced would be injected, no surface waters of the State would be affected by the management of produced water. All injection wells would be permitted with the state agency that regulates the facilities, including but not limited to the WOGCC or WDEQ.

Produced water would be collected in a buried HDPE flowline (pipeline) for transport to an injection well. To keep surface disturbance to a minimum, ditches would combine as many pipelines as possible (e.g. water, electricity, and gas) and BMPs would be used to control erosion and divert overland flows away from the facilities. Centrifugal pumps, reciprocating pumps, filter systems, and tanks at the disposal facility would be used to remove solids from the water stream and to pump the water at pressures sufficient to allow downhole disposal. If it is not possible to safely inject the volume of produced water into the proposed injection wells, some or all of the exploratory wells would be shut-in temporarily while alternative plans are developed and approved. These alternative plans would include additional injection wells. Information about the groundwater system in the BCII PA would be obtained in two ways: first, by monitoring the quality of produced water and second, by monitoring the volume of water produced over time during testing.

The absence of tritium in groundwater is indicative of water that was isolated from the atmosphere prior to the early 1950s when large amounts of tritium were introduced into the environment through testing of nuclear devices in the atmosphere (Faure 1986). The tritium content of the eight samples indicates pre-1950s recharge. Furthermore, the isotopic ratios of ^{18}O and deuterium indicate that the groundwater was isolated from the atmosphere when the mean temperature was approximately 10 degrees cooler than present. Since temperatures this low are associated with the Pleistocene Epoch, which ended approximately 10,000 years ago, this information suggests that groundwater flow through the Mesaverde Group coals is sluggish and apparently not closely connected to nearby surface water supplies. **Table 4-1** presents the results of the isotopic analysis.

Table 4-1
Isotopic Analysis of Mesaverde Formation Coal Seam Groundwater

Well	Tritium Content (TU)	$\delta^{18}\text{O}$ SMOW (0/00)	δD SMOW (0/00)
Fed. 1691-16-8	<0.34	-19.32	-145.5
AR Fee 1791 231 Haystack Mountains	<0.50	-19.70	-148.4
AR Fee 1791 231 Deep Creek	<0.60	-19.60	-145.8
AR Fee 1791 231 Cherokee Creek	>0.60	-19.49	-146.7
AR Fee 1791 3-23	<0.50	-18.85	-141.7
AR Federal 1591 91	<0.50	-19.39	-144.4
AR Fee 1890 SE9	<0.50	-19.74	-148.5
AR Federal 1591-7-8 Blue Sky	<0.60	-19.20	-142.9

Notes:

TU= Tritium Unit. One TU is defined as one tritium atom per 1,018 hydrogen atoms.

SMOW= an international standard used for oxygen and hydrogen isotopic analysis.

0/00 is per mil or per thousand.

Potential effects on surface water resources would include increased surface water runoff and off-site sedimentation caused by soil disturbance, impairment to surface water quality, and changes in stream channel morphology caused by construction and road/pipeline crossings.

The effects of construction could produce more sediment, which could potentially end up in drainage channels and alter the flow of the channels. The increased sedimentation would be temporary and would principally occur during construction. Mitigation measures implemented after the construction phase would prevent further sedimentation in drainage channels.

The aspect and gradient of slopes in the project area could alter the flow of surface water. Steep slopes would increase the surface water velocity, which would accelerate the erosional process and would allow for the sediment to be deposited, further altering the flow.

The top layer of soil is generally the most nutrient rich horizon and most important to the success of vegetation. Complete removal of this horizon would impede the germination and establishment of vegetation.

Construction of wells in poor quality soil would likely increase the potential for water resource contamination. Compaction of a poorly drained soil would further limit the ability of the soil to drain, which would increase surface run-off, potentially increasing sedimentation in local water resources.

Timely implementation is essential to the success of mitigation measures. Soils exposed for long periods of time are likely to erode with potential for loss of valuable topsoil and contamination of local water resources. Initiating mitigation measures immediately after construction is completed would increase the chances for successful seeding and soil stabilization. The re-establishment of root systems and ground cover would greatly decrease the potential for wind or water erosion.

Increases in sedimentation that would occur as a result of the proposed project would be small, because construction and operation would comply with the mitigation measures described in Chapter 2. Potential impacts from construction would likely be greatest in the short-term and would decrease in time as a result of stabilization, reclamation, and revegetation. Construction disturbance would not be uniformly distributed across the BCII PA, but instead would be concentrated near proposed drill locations, access roads, and pipeline/utility ROWs.

4.5.2 No-Action Alternative

Under the No-Action Alternative, the proposed natural gas development would not occur. Therefore, no new impacts to surface or groundwater would occur as a result of natural gas exploration in the BCII PA.

4.6 VEGETATION, WETLANDS, AND INVASIVE WEEDS

4.6.1 Proposed Action

Implementation of the proposed project would result in the loss of native vegetation, especially forb species, in terms of cover and species composition in areas where proposed well sites, facilities, and access roads would be constructed. There is currently no approved forb seed

mixture that could be applied to reclaimed areas and natural recolonization of forb species is very slow to occur. An estimated 78.1 acres would be temporarily affected by surface disturbance associated with drilling and testing activities. Should the exploratory wells be productive, the surface areas required for production facilities would not be reclaimed until production ends, which could be up to 20 years. An estimated 20.8 acres could be permanently affected by production facilities and roads over the long-term.

Mountain big sagebrush and Wyoming big sagebrush would be the primary plant communities disturbed in the BCII PA. These plant communities are commonly found across southwestern Wyoming; therefore, the short-term or long-term loss of these plant community acreages in the BCII PA would not alter the overall project area or regional abundance and quality of these habitats, except for specialized habitat requirements of wildlife species (described in **Section 4.8**). The total acreage of long-term vegetation impacts within the BCII PA are found in **Table 4-2**.

Table 4-2
Long-Term Vegetation Impacts

Vegetation Community	Impacted Acres
Mountain big sagebrush	13.5
Wyoming big sagebrush	4.8
Alkali sagebrush	1.8
Juniper woodlands	0.7
Total	20.8

In general, the duration and effects on vegetation in the BCII PA would depend on the time required for natural succession to return disturbed areas to pre-disturbance conditions of diversity (both species and structural). In addition, the success of mitigation (seeding) would be influenced by climatic and soil conditions.

Surface disturbance could affect vegetation directly and indirectly by removal of existing vegetation and by allowing establishment of noxious and invasive weeds. Weedy species often thrive on disturbed sites such as road ROWs and out-compete more desirable plant species. This would result in reduced species diversity, reduced vegetative structure, and potentially reduced ground cover. The BCII PA is known to be vulnerable to invasion of noxious and invasive weed species and the potential for weeds to occur would increase with construction activities occurring in the BCII PA. Utilizing proper BLM approved reseeding mixtures would help mitigate the potential for invasive weed infestation on disturbed sites. Additionally, monitoring of disturbed sites would be required to identify any noxious weed invasion.

Development of the proposed project is not expected to directly affect Federally-listed plant species. None of the seven BLM sensitive plant species discussed in Chapter 3 have known occurrences in the BCII PA (WYNDD 2005). No threatened or endangered plant species are expected to occur in the BCII PA because of a lack of suitable habitat. Due to the small amount

of disturbance and lack of suitable habitat associated with the Proposed Action, no impacts to sensitive plant species are expected to occur.

A total of 4.2 acres of wetlands are mapped within the BCII PA. A total of 0.13 acre of wetlands is located is mapped at the proposed AR Federal Well 1491 1-11 site. The proposed well will be located on a previously disturbed ridge, adjacent to an existing well pad. At the time of the site visit no wetland indicators were observed at the proposed well site. Therefore, no direct impacts to jurisdictional wetlands or riparian areas are expected to occur.

4.6.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas impacts to vegetation or wetlands would occur. Additionally, no new disturbances would occur that could allow invasive weed infestation to occur in the BCII PA.

4.7 RANGE RESOURCES AND OTHER LAND USES

4.7.1 Proposed Action

Anticipated effects on range resources associated with the project are limited to a long-term loss of 20.8 acres of forage and associated AUMs, an increased potential for collisions between livestock and vehicles, an increased potential for dust and subsequent reduced palatability of forage, and an increased potential for the spread of noxious and invasive weed species (previously discussed above under the section on Vegetation, Wetlands, and Noxious Weeds).

Livestock grazing would continue during drilling and interim development and the increased traffic during these phases would correspondingly increase the potential for dust and the potential for collisions between livestock and vehicles. Forage in the BCII PA would be reduced slightly during drilling and field development due to vegetation removal and increased dust, but would be restored as soon as practical and would not constitute a large impact at this level of development. Areas used for roads, production equipment, and ancillary facilities would remain disturbed throughout the productive life of the field.

The average stocking rate for the CGA is eight acres per AUM. The proposed project would result in a short-term loss of forage (78.1 acres) and would temporarily remove 9.8 AUMs from the CGA. The long-term forage loss (20.8 acres) would eliminate approximately 2.6 AUMs from the CGA.

Reclamation may increase forage production and availability in the short-term, since sagebrush would be removed and reseeded with native grass species. This would be beneficial to grazing species such as big game and cattle.

4.7.2 No-Action Alternative

Under the No-Action Alternative, none of the proposed natural gas activities would occur in the BCII PA. Therefore, loss of rangeland and AUMs due to development would not occur. However, beneficial results of the Proposed Action (e.g. increases in native grasses) for rangeland dependent livestock and big game also would not occur.

4.8 WILDLIFE AND FISHERIES

4.8.1 Proposed Action

The proposed development would disturb 78.1 acres of general wildlife habitat during the development phase and would disturb 20.8 acres over the life of the project. Analysis of potential impacts of the Proposed Action on wildlife assumes development of the proposed wells, roads, and ancillary facilities in the approximate locations identified in Chapter 2.

During the production phase, the unused portion of well sites would be reclaimed. Following completion of production operations (the life of the project is estimated at 10-20 years), the well field and ancillary facilities would be reclaimed and abandoned. Well pads would be removed and the areas revegetated with seed mixes approved by the BLM. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts. Additionally, another extremely important factor is the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Grasses and forbs are expected to become established within the first several years following reclamation; however, much more time would be required to achieve reestablishment of shrub communities. For example, mountain big sagebrush returning to pre-existing levels of sagebrush cover following prescribed burns in this area has been documented to take 40-50 years. Consequently, disturbance of shrub communities would result in a long-term loss of these important habitats.

In addition to the direct loss of habitat due to construction of proposed well pads, roads, and pipeline/utility ROWs, disturbances from human activity and traffic would lower wildlife utilization of habitat immediately adjacent to these areas. Species that are sensitive to indirect human disturbance (e.g. noise and visual disturbance) would be impacted the most. Habitat effectiveness of these areas would be lowest during the construction phase when human activities are more extensive and localized. Construction activities within the specified radius of sensitive species would be restricted. Exceptions may be granted by the BLM if they determine the activity has no impact on the species. Disturbance would be reduced during the production phase of operations and some animals may become accustomed to equipment and facilities in the gas field and may once again use habitats adjacent to disturbance areas, while other animals may move to other areas outside the disturbance area.

General Wildlife

The direct project disturbance of wildlife habitat in the BCII PA and outside the project boundaries would reduce habitat availability for a variety of common small mammals, birds, and their predators. The initial phases of surface disturbance would result in some direct mortality to small mammals and the displacement of songbirds from construction sites. In addition, a slight increase in mortality from increased vehicle use of roads in the project area is expected, but quantification of these losses is not possible. The temporary disturbances that occur during the construction period would tend to favor early succession wildlife species such as ground squirrels and horn larks and would have more impact on mid-to-late successional species such as sage sparrows, sage thrashers, and voles. The long-term disturbance would have little effect on wildlife species not dependent upon shrubs. In addition to the direct disturbance acreage, dust would directly and indirectly impact an estimated 15% to 30% more acreage.

Big Game

Impacts to big game wildlife species would include direct loss of habitat and forage, and increased disturbance from drilling, construction, and maintenance operations. Construction activities associated with well pads and roads can reduce the use of surrounding habitat by big game. Although these impacted sites reduce foraging due to the direct loss of native vegetation from ground disturbance, there is an area surrounding these sites that tends not to be utilized due to increased human activity and this “zone” can extend up to 0.5 mile from the developed area. Consequently, development impacts to wildlife can extend further off-site than the actual amount of ground disturbance.

The BCII PA supports pronghorn antelope throughout the year and 78.1 acres of pronghorn winter/yearlong range within the BCII PA would be disturbed under the Proposed Action. 20.8 acres of winter/yearlong range (0.6% of the winter/yearlong habitat in the Baggs Herd Unit within the BCII PA) would be disturbed for the life of the project. No pronghorn crucial winter range would be disturbed under the Proposed Action. Activities associated with the construction phase of the project could temporarily displace pronghorn; however, once construction is complete, some pronghorn would likely habituate and return to pre-disturbance activity patterns, while other animals may move to other areas outside the disturbance area. Reeve (1984) found that pronghorn acclimated to increased traffic volumes and machinery as long as the traffic and machines moved in a predictable manner. In combination, the disturbance of pronghorn seasonal ranges and the potential for pronghorn displacement would reduce the quality of pronghorn habitat surrounding project facilities on the BCII PA.

The BCII PA supports mule deer throughout the year; the northeastern and northwestern portions of the BCII PA (2,070.6 acres) are within winter/yearlong range and the southwestern portion of the BCII PA (1,621.4 acres) is within crucial winter/yearlong range. The proposed wells and developments within the BCII PA would occur in 25.8 acres of mule deer winter/yearlong range and 51.5 acres of crucial winter/yearlong range. Approximately 4.8 acres of mule deer winter/yearlong range (0.2% of the winter/yearlong habitat in the Baggs Herd Unit within the BCII PA) and 16.0 acres of crucial winter/yearlong range (1.0% of the crucial winter/yearlong habitat in the Baggs Herd Unit within the BCII PA) would be disturbed within the BCII PA for the life of the project. Activities associated with the construction phase of the project could temporarily displace mule deer; however, once construction is complete, some of the mule deer would likely habituate and return to pre-disturbance activity patterns, while other animals may move to areas outside the disturbance area. In combination, the disturbance of mule deer seasonal ranges and the potential for mule deer displacement would reduce the quality of mule deer habitat surrounding project facilities on the BCII PA.

Almost the entire BCII PA is classified as elk winter range (3,688.7 acres) with only the extreme northeast corner of the project area classified as winter/yearlong range (3.3 acres). All of the proposed wells and developments within the BCII PA would occur in elk winter range for a total of 77.3 acres of disturbance under the Proposed Action. 20.8 acres of elk winter range (0.6% of the winter range in the Sierra Madre Herd Unit within the BCII PA) would be disturbed within the BCII PA for the life of the project. The potential for elk displacement would reduce the quality of elk habitat surrounding project facilities on the BCII PA. Disturbance of elk while on winter range can increase stress and may influence species distribution (Hayden-Wing 1980, Morgantini and Hudson 1980).

According to management directives in the RMP (USDI-BLM 1990), crucial big game winter ranges will be closed from November 15 to April 30; this closure of areas located in crucial big game winter ranges will reduce disturbance to wintering big game.

Greater Sage-Grouse

Suitable greater sage-grouse habitat is abundant on and around the BCII PA; however, specific measures must be taken to avoid impacting this species. Greater sage-grouse are of special concern because populations throughout the west have been declining; they are listed as a BLM sensitive species, and have been petitioned for listing under the ESA. Under the Proposed Action, 43.7 acres of mountain big sagebrush, the primary vegetation cover type in the BCII PA, would be impacted during construction and 13.5 acres would be impacted in the long-term. Additionally, 15.9 acres of Wyoming big sagebrush would be impacted during construction and 4.8 acres would be impacted in the long-term. Greater sage-grouse may also avoid areas associated with development, including roads and well pads. Greater sage-grouse may also be impacted by noise disturbance associated with human activity, traffic, compressor stations, and drilling operations. Resource specific mitigation measures for greater sage-grouse identified in Chapter 2 would reduce the impacts to leks, nesting areas, and winter habitats. Four active sage-grouse leks have been identified within two miles of the BCII PA (one active lek is located within the BCII PA).

Construction activities within a two-mile radius of occupied leks would be restricted between March 1 and July 15 to provide protection for grouse during the egg-laying, incubation, and brood-rearing period. Throughout the construction period, surface disturbing activities would not be allowed within 0.25 mile of the perimeter of identified active or occupied greater sage-grouse leks. Human activity would be avoided between 6:00 p.m. and 9:00 a.m. from March 1 to May 20 within 0.25 mile of the perimeter of occupied leks; surface disturbance and other actions that create permanent and high-profile structures such as buildings, storage tanks, and overhead power lines will not be constructed within 0.25 mile of the perimeter of leks, as determined on a case-by-case basis.

Raptors

The potential impacts of the Proposed Action on raptors are: (1) nest abandonment and/or reproductive failure caused by project-related disturbance, (2) increased public access and subsequent human disturbance resulting from new road construction, and (3) small, temporary reductions in prey populations.

The primary potential impact to raptors from project activities is human disturbance during the nesting season (February 1-July 31), which might result in reproductive failure. To reduce this potential, disturbance would not be allowed during the critical nesting season near active raptor nests. Seasonal timing restrictions within a “buffer zone” around nests to avoid disturbance to nesting raptors should reduce impact from construction activities. The BLM would require the relocation of well pad facilities if they are located within 1,200 feet of a ferruginous hawk nest and within 825 feet of any other hawk species nest. Based upon BLM data, 19 raptor nests (five ferruginous hawk, four red-tailed hawk, one artificial ferruginous hawk, one Swainson’s hawk, and eight unknown nests) were documented within the analysis area. Raptors may nest in currently unoccupied areas in the future and if active nests are located on the project area in

future years, appropriate avoidance and mitigation measures would be taken to avoid impacts to breeding raptors.

Fish

No impacts to fish resources are anticipated in the BCII PA due to the lack of any perennial streams.

4.8.1.1 Threatened, Endangered, and Proposed Wildlife and Fish Species

Wildlife Species

In Wyoming, white-tailed prairie dog colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food, and they depend upon prairie dog burrows for shelter, parturition, and raising young (Hillman and Clark 1980). Two prairie dog colonies have been mapped within the BCII PA. One colony, totaling 24.9 acres, is located in the eastern portion of the BCII PA and is located in a block-cleared zone; therefore, black-footed ferret surveys are not necessary. The other colony, totaling 43.6 acres, was mapped in the northern portion of the BCII PA and it is not in a block-cleared zone. According to USFWS guidelines (2004), prairie dog complexes greater than 200 acres in size that contain colonies within 4.3 miles of each other represent potential habitat for black-footed ferrets.

The RFO attempts to move all surface disturbing activities outside of prairie dog towns, since prairie dogs are on the Wyoming BLM State Sensitive Species List. White-tailed prairie dog towns located within the BCII PA are not expected to be disturbed given the current locations of proposed wells and access roads.

Canada lynx are not expected to occur on the BCII PA because of the lack of suitable habitat; however, there is a slight potential that lynx may migrate through the area. The proposed project is not expected to prevent potential lynx migration through the area.

Bald eagles typically build stick nests in the tops of large coniferous or deciduous trees along streams, rivers, or lakes. This type of habitat is not present in the BCII PA and bald eagles are not known or expected to nest in the BCII PA. Bald eagles may utilize the BCII PA during winter months when big game species are more concentrated on winter ranges. However, the BCII PA does not support concentrated use by bald eagles and their use of the project area is likely incidental. Bald eagles may feed on road-killed carrion in the general vicinity of the BCII PA and workers should be educated about the danger of striking a bald eagle with a vehicle along the main highways and roads providing access to the BCII PA. The Proposed Action is not expected to impact bald eagles, provided that the avoidance and mitigation measures in this document and the RMP are implemented.

4.8.1.2 Sensitive Wildlife and Fish Species

Wildlife Species

Of the sensitive species listed by the WYNDD and BLM for the RFO area (USDI-BLM 2002), the species that are known or suspected to occur in the BCII PA are the white-tailed prairie dog, northern plateau lizard, sage sparrow, Brewer's sparrow, sage thrasher, burrowing owl, short-eared owl, loggerhead shrike, golden eagle, Columbian sharp-tailed grouse, mountain plover, ferruginous hawk, and the greater sage-grouse.

Burrowing owls are typically associated with prairie dog burrows. Burrowing owls may utilize the prairie dog towns in the BCII PA; however, no disturbance is proposed to occur in the prairie dog towns. Therefore, the proposed development is not expected to impact burrowing owls or white-tailed prairie dogs. The sage sparrow, Brewer's sparrow, sage thrasher, and loggerhead shrike are all associated with shrub-dominated habitats (primarily sagebrush and greasewood in the BCII PA). Minimizing disturbance of these habitats would decrease any potential impacts to these species. However, human activity may temporarily displace these species from areas near project facilities.

Although mountain plover habitat does not occur in the BCII PA, some areas of potential mountain plover habitat do occur. The proposed AR Federal Well 12-12, and its associated facilities, will impact 0.49 acre of this habitat. Of this, 0.05 acre will be impacted by the pad site, 0.39 acre will be impacted by the gas line, and 0.05 acre will be impacted by the utility line. No mountain plovers were observed in the potential habitat areas during surveys conducted in 2001, 2002, and 2003. Impacts to mountain plovers would be avoided by adhering to the requirements outlined in Chapter 2, including not allowing construction activities in potential plover nesting habitat during the nesting period from April 10 to July 10. The exact location of mountain plover nests may change annually; however, mountain plovers usually return to the same general area year-to-year and, therefore, mountain plover nest activity status and locations should be kept current. For this reason, it is recommended that surveys for mountain plovers be conducted within areas of potential habitat should development occur between April 10 and July 10 of any year. Due to the size of the proposed impacts, existing disturbances, and management practices outlined in Chapter 2, no adverse impacts to mountain plover are anticipated.

The long-eared myotis, fringed myotis, Townsend's big-eared bat, Wyoming pocket gopher, black-footed ferret, Hoary bat, ringtail, silver-haired bat, western small-footed myotis, Wyoming ground squirrel, and swift fox are mammals listed on the WYNDD and RFO Sensitive Species List. The white-faced ibis, trumpeter swan, northern goshawk, peregrine falcon, long-billed curlew, yellow-billed cuckoo, American avocet, ash-throated flycatcher, black-throated gray warbler, canyon wren, juniper titmouse, merlin, sandhill crane, Scott's oriole, snowy plover, western scrub-jay, chestnut – collared longspur, short – eared owl and Baird's sparrow are WYNDD and BLM-listed sensitive birds. The northern leopard frog, northern many-lined skink, tiger salamander, great basin spadefoot toad, and boreal toad are WYNDD and BLM-listed sensitive amphibians and reptiles. It is unlikely for any of these species to occur in the BCII PA due to the lack of suitable habitat.

Fish Species

No sensitive fish species are known to occur within the BCII PA. The roundtail chub, bluehead sucker, flannelmouth sucker, and Colorado River cutthroat trout are WYNDD and BLM-listed sensitive fish species. There is no desirable habitat for these species within the BCII PA; therefore, no impacts are expected to occur.

4.8.2 No-Action Alternative

Under the No-Action Alternative, the coordinated POD described under the Proposed Action would not be approved. Therefore, no additional effects on wildlife and fish resources would be expected to occur if the proposed wells are not drilled.

4.9 RECREATION

4.9.1 Proposed Action

Impacts to hunting, the primary recreation activity in the BCII PA, would occur as a result of the Proposed Action. The development would result in the removal of wildlife habitat due to the construction of well pads and associated roads. Additionally, disturbance from human activity and traffic would lower the use of habitat by wildlife and cause wildlife to disperse to adjacent undisturbed habitat. Decreased wildlife use of the BCII PA would result in less visitation by local and nonresident hunters.

The extent of wildlife displacement is difficult to predict, as the BCII PA has been used for energy development activities for many years. Ongoing energy development has allowed resident deer and antelope to become accustomed to the noise and human activity in and near the BCII PA. However, the displacement of some big game is likely over the course of the proposed project but, due to the size of the hunt area, this project alone is not likely to reduce herd sizes to a point where WGFD would reduce the number of licenses offered in the hunt area.

Undisturbed landscapes, isolation, and solitude are usually important to non-consumptive users such as photographers, pleasure drivers, and wildlife viewers. Development of the BCII PA would potentially affect the recreation setting due to visual impacts and increased traffic on roads. Changes in the visual setting would be noticed by hunters and other recreational users. This visual degradation would diminish the quality of the recreational experience for most visitors to the BCII PA. Other detractions to the recreational experience would be industrial traffic; noise from traffic, construction, and drilling operations; and dust generated by these activities. These impacts would continue to a lesser degree throughout the life of the project.

Overall impacts to recreation resources would be considered moderate due to the short-term nature of drilling and construction activities, concentrated locations of activities, and the small number of recreational users affected. However, most hunters that normally hunt the project area would hunt other areas to avoid the development activity and reduced desirability of the hunting experience due to visual impacts, habitat loss, and the hazards of gunfire in an industrial area.

4.9.2 No-Action Alternative

Under the No-Action Alternative, no disturbance to hunting and other recreation would occur in the BCII PA as a result of the proposed project.

4.10 VISUAL RESOURCES

4.10.1 Proposed Action

The BLM VRM classification for the BCII PA is Class III. The visual resource management objective for the BCII PA is to allow a moderate level of contrast between project features and the existing landscape. In this management system, the severity of impacts is related to the scenic quality, sensitivity level, and distance zone of the affected environment. In general, short-term impacts would be most severe where the level of contrast is high and highly visible to a potentially large numbers of viewers. The short-term impacts of drilling and field development would exceed the level of contrast permitted in Class III areas. These impacts would dominate the viewshed as seen from Wild Horse Road (BLM 3309), which is located on a ridgeline and has panoramic views.

Due to terrain and elevation, only a small portion of the BCII PA would be visible from SH 789. Drill rig masts located on western edges of buttes and ridges may be visible from this highway; therefore, short-term visual impacts may occur during this phase of development.

Short-term impacts to visual resources associated with construction and drilling would include contrasts in line, color, and texture. These contrasts are associated with drilling rigs, construction equipment, facilities, roads, bare well pads, trailers, and the general industrial character of drilling. Additional impacts may occur from fugitive dust produced by construction and increased vehicle traffic.

Permanent wells, production facilities, and access roads would remain after drilling is complete. The presence of permanent facilities would create continued visual impacts due to contrast in line, form, color, texture, and overall pattern in the landscape over the long-term. Geometric lines associated with these facilities would contrast with vegetation and topography in the BCII PA. Mitigation measures would reduce these visual impacts, but the development would still dominate the viewshed and therefore exceed VRM Class III management criteria.

4.10.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas development impacts to visual resources would occur in the BCII PA as a result of the proposed project.

4.11 CULTURAL RESOURCES

4.11.1 Proposed Action

Federal law and regulations protect cultural resources on public lands, including archaeological sites and historic properties. Cultural resources in the interim drilling area and adjacent lands may have already been affected by surface-disturbing activities, including ongoing natural gas development, road building, and construction of pipelines.

Existing, proposed, or reasonably foreseeable development could add to the level of impact on cultural resources in the immediate area, unless inventories and protective or mitigation measures specified by BLM are followed.

Cultural resources surveys have been completed in the BCII PA, as required by the Interim Drilling Policy, and two NRHP eligible sites were identified. The historic Cherokee Trail (Trail) crosses the northeastern portion of the BCII PA and is currently recommended as eligible for listing on the National Register of Historic Places. Non-contributing and contributing segments of the Trail were identified within two miles of the proposed project. One prehistoric camp site was identified near to a proposed well location.

Native American religious sites have not been previously identified in the BCII PA and the Class III survey did not identify any of these sites in the BCII PA.

It should be possible to eliminate direct and indirect adverse effects to historic properties from the proposed action through avoidance or mitigation measures (data recovery or recordation) on a case-by-case basis. Adverse effects to contributing segments of the Trail are avoided by a minimum of 0.25-mile buffer zone or by locating facilities outside the visual horizon. Other

mitigation measures initiated to protect cultural resources would be ensuring natural colors are utilized for facilities and roads. The potential for incremental increases in cumulative impacts would be circumvented by avoiding known cultural and historical sites in laying out drill sites, access roads, and pipeline corridors. Some unintentional damage to subsurface resources could occur during grading or excavation. However, implementation of resource protection and mitigation measures similar to the techniques described in Chapter 2 would protect these resources when they are discovered.

4.11.2 No-Action Alternative

Under the No-Action Alternative, no cultural resources sites would be disturbed by new natural gas development in the BCII PA.

4.12 SOCIOECONOMICS

4.12.1 Proposed Action

Socioeconomic impacts of the Proposed Action would be largely positive. The project would enhance regional economic conditions and generate revenues from local, State, and Federal government taxes and royalties. Most of the workforce would originate from personnel located in southwestern Wyoming. The relatively small, short-term field development workforce would not create a local boom or increased demand for temporary housing or local government services.

Development and operation of the project would require goods and services from a variety of local and regional contractors and vendors. Expenditures by the Proponents for these goods and services, coupled with employee and contractor spending, would generate economic effects in Carbon County and southwest Wyoming. It is reasonable to assume that the direct and indirect economic benefits of the proposed project would be positive.

4.12.1.1 Oil and Gas Activity in Carbon County

In 2004, 151 APDs were issued for natural gas wells in Carbon County. The 12 new proposed wells associated with this project would be approximately 11% of the 2004 APD level for the County; therefore, this project would not result in a large increase in natural gas wells in Carbon County. However, if successful, this project may increase the likelihood for the ARPA to be developed.

4.12.1.2 Population Effects

The proposed project would not result in a noticeable population increase in Carbon County. Most of the skills and services required for the project are available in the local labor pool, although the recent increase in oil and gas drilling in southwest Wyoming has absorbed much of the available workforce. The proposed project would require 16 to 36 drilling and field development workers for a period of two to three months; many of these workers would be from southwestern Wyoming.

Based on the relatively small workforce and short-term nature of the drilling and field development phase of the proposed project, area housing and businesses could accommodate the increase in activity resulting from the development of the proposed project.

4.12.1.3 Temporary Demand for Housing

Existing housing in Rawlins and nearby communities could accommodate the relatively small demand for temporary housing during drilling and field development associated with the Proposed Action.

4.12.1.4 Law Enforcement and Emergency Response

The relatively small level of field development and operations personnel would be accommodated by existing law enforcement and emergency management resources.

4.12.1.5 Fiscal Effects

The Federal government receives a 12.5% royalty on the fair market value of natural gas produced from Federal leases. Half of these royalties would be returned to the State of Wyoming, which collects a 6% severance tax on gas production, exempting Federal royalties, production, and transportation costs. The State also collects a 4% sales tax on goods and 28% of these funds are returned to the local county. These natural gas revenues represent a substantial funding source for the State of Wyoming and Carbon County.

If the productive life of each successful gas well in the project is 15 years and produces, on average, nearly 100,000 cubic feet of natural gas per year, which is then sold (on average) for \$2.50 per thousand cubic feet, the sales value of each well would be approximately \$3.5 million over the life of the project. If 10 Federal gas wells within the project were productive, the Federal royalties would be approximately \$6 million and the severance tax collected by the State of Wyoming would be approximately \$2 million. These numbers are approximate, and are only intended to indicate the order of magnitude of possible fiscal effects.

4.12.2 No-Action Alternative

Under the No-Action Alternative, no Federal mineral royalties would be gathered and no additional socioeconomic effects would be expected to occur if the BCII PA wells are not drilled.

4.13 TRANSPORTATION

4.13.1 Proposed Action

4.13.1.1 Federal and State Highways

The Proposed Action would cause small increases in traffic volumes, which would result from movement of project-related workers, equipment, and materials to and from the BCII PA for drilling, field development, well service, field operations, and reclamation.

Chapter 2 discussed the average number of trips associated with various field activities. It was determined that drill rigs, water trucks, and other heavy equipment would be transported to the BCII PA and remain there until drilling is complete. Materials and supplies would be delivered to the BCII PA on a weekly basis and stored at a staging area. All personnel would commute daily to the project site with the exception of drilling engineers, who would stay within the BCII PA near the drill site during the work week. Based on this plan, the Proposed Action would generate 15 to 20 round trips per day over the course of the drilling and field development period. After drilling and field development is complete, project-related traffic would average one or two trips per day. Slightly higher peak periods would occur when maintenance activities

are performed on wells and facilities. Based on these estimates, the increase in area traffic associated with the Proposed Action would not affect the level of service for IH 80 or SH 789 (Rounds 2000).

Based on the relatively small traffic increases and short duration in traffic volume, it is unlikely that the Proposed Action would result in a measurable increase in accident rates on Federal and State highways. During the operations phase, the probability of an increase in accident rates that could be attributed to the project would be negligible.

4.13.1.2 County Roads

A slight increase in traffic on the roads that provide access to the BCII PA may occur. The relatively small, short-term increases in traffic are unlikely to result in substantial deterioration of the roads or substantial increases in accidents. The primary effects of increased project-related traffic on County and BLM roads would be accelerated requirements for maintenance.

Increased traffic may raise the potential for accidents between vehicles and livestock. The potential for these accidents increases during calving and periods when cattle are moving to new ranges. To reduce the likelihood of this occurring, the Proponents should coordinate their development efforts with ranchers to prevent these accidents.

4.13.1.3 Internal Roads

The BCII PA transportation measures proposed by the Proponents are described in Section 2.1.2.1. Based on the proposals, an estimated 5.2 miles of new roads would be constructed within the project area. The construction of these roads would cause no fiscal impacts for the BLM because the project Proponents are responsible for the construction and maintenance of these roads.

4.13.2 No-Action Alternative

Under the No-Action Alternative, no additional roads would be constructed to access natural gas facilities. Additionally, traffic levels would remain at existing levels in the BCII PA.

4.14 HEALTH AND SAFETY

4.14.1 Proposed Action

There is a relatively low risk to project workers from industrial accidents, firearm accidents, and natural disasters. There would be a slight increase in risk for the general public from traffic accidents and range fires during drilling and field development. Only a small increase in these risks would occur during field operations.

4.14.1.1 Occupational Hazards

Two types of workers would be employed at the BCII PA: oil and gas workers and special trade contractors. Oil and gas workers had an annual accident rate of 4.0 accidents per 100 workers in 1998 and special trade contractors had a non-fatal accident rate of 8.9 accidents per 100 workers in 1998 (U.S Department of Labor 2002). These rates are comparable to the overall private industry average for all occupations of 6.2 accidents per 100 workers.

Recently, there has been concern among CBM workers that training and safety standards used for conventional oil and gas activities may not be appropriate for the CBM industry (Rock Springs Rocket Miner 2001). The Wyoming Occupational Health and Safety Administration, Worker's Safety Division is collaborating with energy company officials to consider revising worker safety standards and training requirements.

The probability of injuries during the drilling and field development phase of the project is low. Based on the small number of employees, the annual statistical probability of injuries during field operations is low.

The BLM, OSHA, United States Department of Transportation (USDOT), and the WOGCC each regulate certain safety aspects of oil and gas development. Provided the Proponents adhere to safety regulations and the various agencies enforce the regulations, the probability of accident or injury would be reduced.

4.14.1.2 Other Risks and Hazards

Risks to public health and safety are not expected to increase as a result of the proposed project. Impacts associated with sanitation or the materials used in CBNG development would be prevented or reduced by implementing the mitigation measures described in Chapter 2.

The risk of fire in the BCII PA could increase as a result of the proposed project, but would remain low. Fire is an inherent risk associated with construction; industrial development; and the presence of fuels, storage tanks, natural gas pipelines, and gas production equipment. This small risk would be reduced because facilities would be situated on pads and in locations that are graded and devoid of vegetation. The risk is further reduced by the presence of fire suppression equipment, a no smoking policy, shutdown devices, and other safety measures typically incorporated into gas production. In the event of a fire, property damage most likely would be limited to construction- or production-related equipment and rangeland resources.

4.14.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas development would occur in the BCII PA, resulting in no increase in safety issues in the area.

4.15 HAZARDOUS MATERIALS

4.15.1 Proposed Action

All project-related activities involving hazardous materials would be conducted in a manner that reduces potential environmental impacts. Potential impacts associated with hazardous materials include human contact, inhalation or ingestion, and the effects of exposure, spills or accidental fires on soils, surface and groundwater resources, and wildlife. No hazardous material, as defined by CERCLA, would be used in the construction or drilling operations associated with the proposed wells and no RCRA hazardous wastes would be generated by well-drilling operations.

The mitigation measures described in Chapter 2 would reduce the risk of spills and accidental fires, and provide protocols and employee training to deal with these events should they occur. Based on successful implementation of these plans and procedures, no impacts associated with hazardous materials are anticipated. Any spills of oil, gas, or any potential hazardous substance

would be reported immediately to the BLM, landowner, local authorities, and other responsible parties and would be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.

4.15.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas wells would be drilled and no issues related to hazardous materials would be encountered in the BCII PA.

4.16 NOISE

4.16.1 Proposed Action

Noise associated with construction and natural gas production operations can cause disturbance that affects human safety (at extreme levels) or comfort and can modify animal behavior. Noise levels that exceed the 55-dBA maximum standard can occur at construction and production operations. Under typical conditions, excess noise levels decline below 55 dBA at 3,500 feet from the source (BLM 1991). Noise levels at 600 feet from the compressor site, contained in an enclosed building, are estimated to be below 55 dBA (BLM 1999b). Construction-related impacts would be short-term, only lasting during construction of well sites, access roads, and other ancillary facilities. Noise would be created over the life of the project at the individual well sites as a result of production facilities.

Due to the low human population density in the BCII PA, noise generating activities associated with the Proposed Action would be a sufficient distance from any homes. Overall noise produced by construction and support services equipment during peak activity periods would be moderate because of the dispersed and short-term nature of these activities. However, some noise disturbance to livestock and wildlife may result from the proposed project.

4.16.2 No-Action Alternative

Under the No-Action Alternative, no noise impacts from new natural gas development would occur in the BCII PA.

4.17 CUMULATIVE IMPACTS

This section describes cumulative impacts related to the Proposed Action under consideration in this EA. The CEQ regulations for implementing NEPA define cumulative impacts as:

“The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions and regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7).

The CEQ guidance limits cumulative impact analysis to “important issues of national, regional, or local significance” (CEQ 1997). Therefore, this section addresses cumulative impacts in an area of influence (AOI). Depending on the resource, the AOI could be the BCII PA or it may have a larger geographic boundary, such as for air quality (expanded regional boundaries).

Past, Existing, and Reasonably Foreseeable Future Activity

Past or existing actions on or in the vicinity of the BCII PA that contribute to cumulative impacts include oil and gas exploration, ranching, and dispersed recreation. Reasonably foreseeable future activities planned for the ARPA include expanded natural gas exploration in the form of 2,000 additional wells. While other additional natural gas exploration may occur, it has not been proposed and is therefore not considered in this analysis.

4.17.1 Cumulative Impacts by Resource

4.17.1.1 Geology, Minerals, and Paleontology

The AOI for geology, minerals, and paleontology would be the ARPA. Existing and reasonably foreseeable actions would not contribute significantly to impacts to geology and mineral resources. Future extraction of natural gas will be increased under proposals being considered for the ARPA. This future extraction will result in depletion of natural gas reserves which is a goal of the BLM and is not considered an adverse impact.

Increased natural gas development may result in the loss of significant fossil resources. Undocumented fossils exist throughout the ARPA, many of which could be scientifically significant. Therefore, potential exponential increases in natural gas development may result in the loss of significant fossils of scientific importance.

4.17.1.2 Air Quality

The AOI for air quality would encompass the ARPA and could extend to Class I or II wilderness areas located within 100 miles of the proposed project. Cumulative impacts from emissions could affect an area well beyond the borders of the ARPA.

Existing and reasonably foreseeable future actions in the ARPA would impact air quality through increased emissions associated with vehicles, machinery, and compressors. The proposed addition of 2,000 natural gas wells and associated facilities in the ARPA would add increased emissions to the regional air emissions. Cumulative impacts were analyzed for these proposed wells during the Atlantic Rim EIS process. This analysis determined that in-field cumulative impacts resulting from project and regional emission sources were below the applicable ambient air quality standards. Additionally, the analysis also determined that far-field cumulative impacts for ambient background pollutants, visibility, and atmospheric deposition were below applicable regulatory standards.

4.17.1.3 Soils

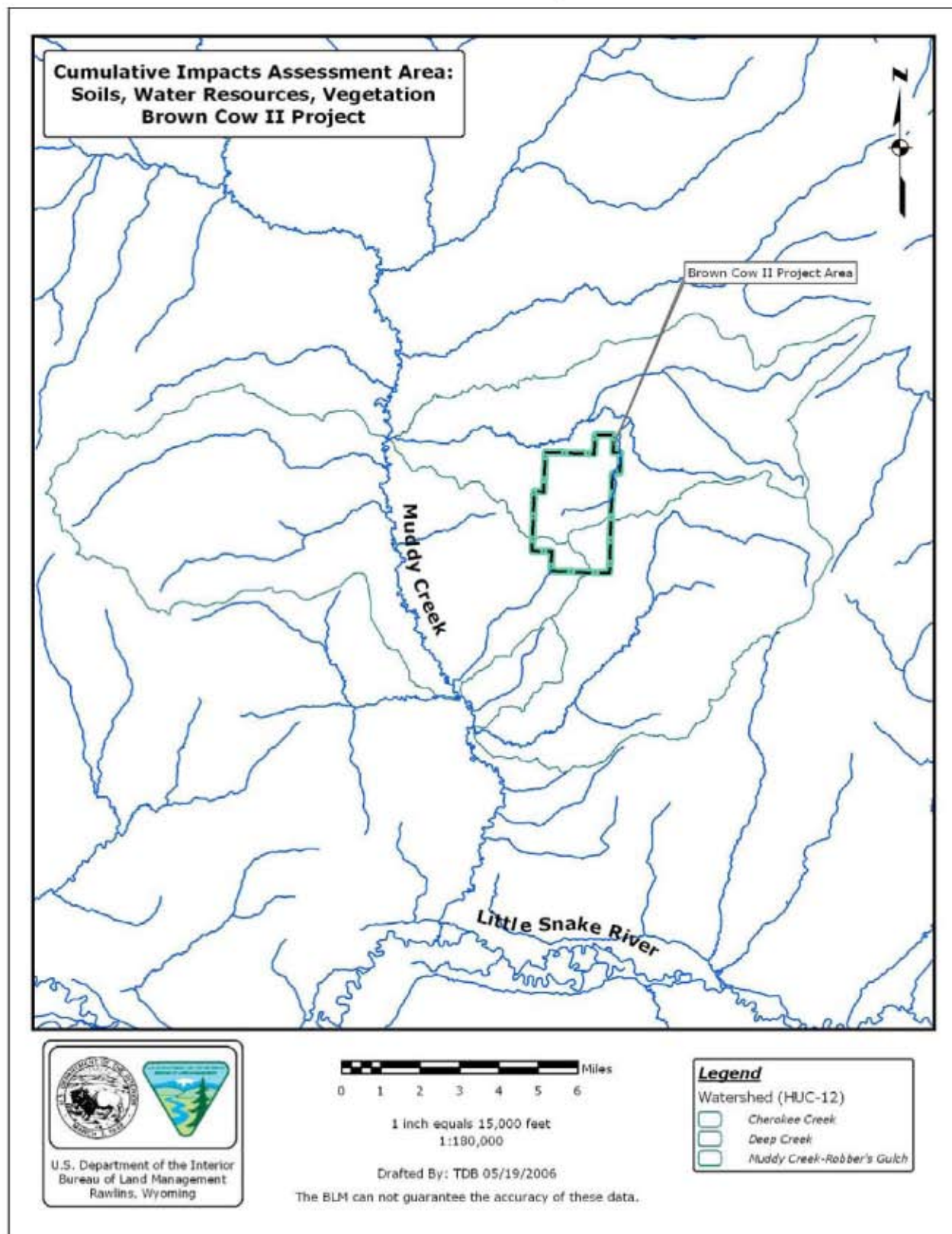
The AOI for soils includes the HUC-12 watersheds inclusive of the BCII PA. Cumulative impacts include effects on soil from existing and planned exploration and development, plus reasonably foreseeable development in the BCII PA. Small impacts to soils can be expected from these actions if all site-specific mitigation and reclamation procedures are followed. Most of the disturbance to soils would be short-term and would not contribute to the loss or degradation of this resource in the future. However, reasonably foreseeable development of natural gas reserves adjacent to the BCII PA in the ARPA would result in the potential for increased erosion and sedimentation in watersheds.

The proposed project (i.e. well locations, facilities, proposed access roads, gathering pipelines, and utility lines) is located within three Hydrologic Unit (HU) 12-level watersheds:

<u>HUC-12 Name</u>	<u>Area</u>	<u>HUC-12 ID #</u>
Cherokee Creek	23,790 acres	140500040305
Muddy Creek – Robber’s Gulch	35,706 acres	140500040306
Deep Creek	22,874 acres	140500040309

These watersheds (see **Figure 4-1**) are located within the Muddy Creek hydrologic basin, tributary to the Little Snake River hydrologic basin, tributary to the Colorado River hydrologic basin, with eventual tributary contribution to the Pacific Ocean. The three HUC 12-level watersheds comprise a total of 82,370 acres. These watersheds serve as discrete planning units of a manageable scale for the assessment of cumulative impacts associated with soil, wetland, and vegetation resources. Thus, this 82,370-acre area is considered the cumulative impacts assessment area (CIAA) for these resources.

**Figure 4-1
Watershed Map**



As of February 2006, there are 72 wells producing, shut-in, or in the process of being drilled within the CIAA (see **Figure 4-2**) in which the project is located. There are nine additional approved APDs on file at the WOGCC. The Proposed Action includes the drilling of 12 additional well locations. In total, there are 93 existing and reasonably foreseeable APDs in the watershed (81 non-project wells).

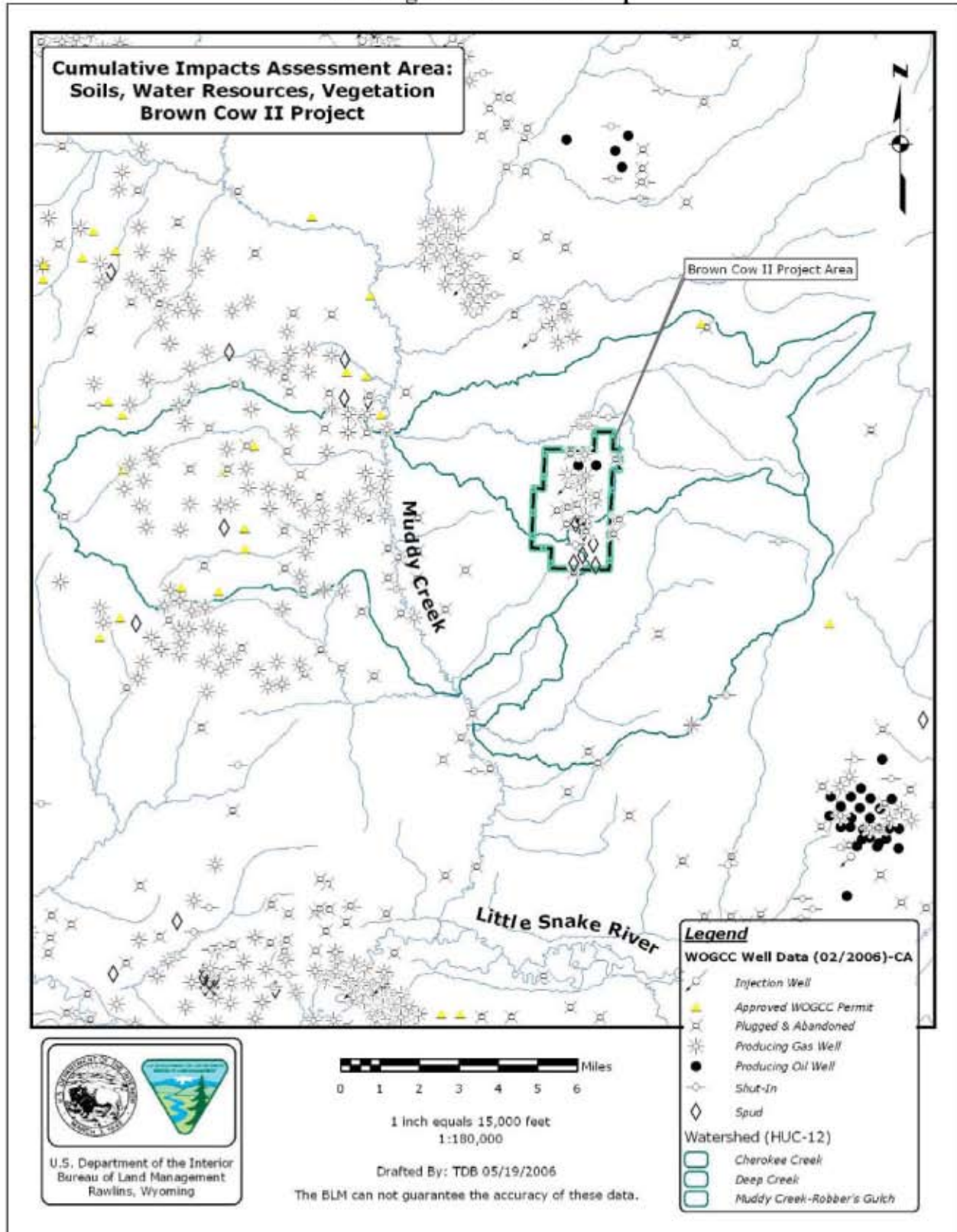
In development of the Desolation Flats EIS, a natural gas project within south-central Wyoming, an analysis of the expected short-term disturbance area for typical oil and gas wells within the exploratory development area provided an estimate of 12.0 acres per well (including well pad, access road, and pipeline) for most wells. It should be noted that the short-term disturbance acreage represents the disturbance associated with a typical well prior to any reclamation activities. Many of the producing wells have been reclaimed to their production facilities.

Other known activities within the CIAA include conventional (deep-gas activity, particularly west of Muddy Creek) and CBNG exploration and development, rangeland management, and outdoor recreation. Several existing roadways are present within the area.

Using an assumption of 12.0 acres of disturbance per well location, the Proposed Action (144 acres), in combination with the 81 existing and reasonably foreseeable non-project wells (972 acres), would result in a total cumulative oil and gas development disturbance (short-term) of 1,116 acres within the watersheds. It is assumed that pipeline disturbances are successfully reclaimed, or soon will be, and existing ancillary facilities are not included due to a lack of knowledge about extant disturbance associated with these features in the CIAA. The total anticipated surface disturbance reasonably foreseeable, and in combination with the Proposed Action, equals approximately 1.4% of the CIAA.

This proposed project, in combination with other reasonably foreseeable activities and actions within the CIAA, is not expected to cumulatively affect resources of consideration if the mitigation measures provided in Chapter 2 as well as BMPs are implemented.

Figure 4-2
Existing Well Locations Map



4.17.1.4 Water Resources

The AOI for water resources is the HUC-12 watershed. Past, present, and reasonably foreseeable land use activities include ranching, oil and gas exploration, and recreational use. Increased future natural gas development in the HUC-12 watershed would contribute to surface water degradation in the watershed. Sediment and salt contributions are expected to increase in the Little Snake River from this future development. Mitigation commitments should help decrease some of the sediment and salt loading.

No serious groundwater pollution has been detected in the watershed. Current and future oil and gas exploration must comply with State and Federal environmental regulations, thereby decreasing the potential for cumulative water quality and quantity impacts.

4.17.1.5 Vegetation, Wetlands, and Invasive Weeds

The AOI for vegetation (including wetlands and weeds) consists of the HUC-12 area. Cumulative impacts for vegetation in the BCII PA would consist of past, current, and proposed natural gas development, and vegetation management connected with range improvements.

The Proposed Action would result in permanent loss of vegetation in the BCII PA. The total long-term loss of vegetative cover from the proposed project is 20.8 acres. A large percentage of this vegetation consists of mountain big sagebrush and Wyoming big sagebrush cover types. These vegetation types are abundant in the project area and throughout south-central Wyoming. Therefore, reductions in these vegetative communities would not be considered a significant impact. Proper reclamation of these native plant communities would ensure that cumulative loss would not occur from increased future natural gas exploration.

The potential for weed infestation exists from current and proposed energy development. Increased soil disturbance from future natural gas development would contribute cumulatively to the BCII PA invasive weed problem. However, following the BLM mitigation requirements for weed infestation would reduce this threat. Overall, only small cumulative impacts to vegetation are expected from this project.

4.17.1.6 Range Resources and Other Land Uses

The AOI for range resources is the 73,966-acre CGA. Cumulative impacts resulting from the Proposed Action would consist of the loss of 20.8 acres, or approximately 0.03% of the CGA. This reduction would not impact the CGA within the range of natural variability. Additionally, the reseeding of disturbed sites would convert sagebrush habitat to native grass habitat, which would be a short-term beneficial range resource impact resulting from the Proposed Action.

4.17.1.7 Wildlife and Fisheries

The AOI for wildlife resources is determined by the ranges of wildlife species and BLM stipulations protecting species from project-related impacts. Big game species have an AOI based on the WGFD herd units. Greater sage-grouse leks have an AOI of a two-mile buffer around the BCII PA. Raptor nests would have an AOI that includes a one-mile buffer around the BCII PA. Other smaller wildlife species would have an AOI of only the BCII PA.

The short-term direct impacts to wildlife would include disruption of wildlife during development and future expansion of CBNG operations. This disruption would include displacement of wildlife, loss of habitat, and greater vehicle access to the BCII PA. Mitigation measures would allow for a quick recovery of the habitat for the displaced wildlife.

Cumulative impacts from the current and proposed development in the BCII PA have the potential to impact big game (e.g. antelope, deer, and elk) in the long-term. Direct impacts to big game would be the combination of the loss of habitat that would be converted to CBNG facilities and human disturbance (e.g. noise, vehicles, and dust). Indirect impacts associated with the project include increased stress due to human/wildlife encounters, potential reductions in birth or survival rates, and fragmentation of migration corridors.

Cumulative impacts to the greater sage-grouse would result from the present and future energy development in BCII PA. The direct impacts associated with construction of the proposed project would be temporary. Increased vehicle traffic, noise, dust, and range improvement projects in the BCII PA and adjacent lands would cause a disruption of normal behavior. The indirect impacts in the BCII PA to the greater sage-grouse could disrupt lek activity, displace nesting birds, and reduce critical wintering habitat.

The cumulative impacts to raptors resulting from existing and proposed energy development are unknown at this time. BLM studies for the ARPA have determined that additional studies are needed to determine energy development impacts to raptors (BLM 2005).

Several BLM sensitive species may occur within the BCII PA. Cumulative impacts to these species should be reduced by the small scale of the proposed project, as only 20.8 acres of permanent disturbance would occur as a result of the proposed project. However, future development may result in additional permanent loss of habitat that could impact certain sagebrush dependent species.

Cumulative impacts to mountain plovers have the potential to occur. While impacts to mountain plover habitat due to the BCII development are less than 0.5 acre, disturbances to the habitat currently exist. Continued development within the habitat may reduce the availability and quality of mountain plover habitat in the BCII PA and adjacent areas in the future.

4.17.1.8 Recreation

The AOI for recreational resources would include the BCII PA and a two-mile buffer around the area. This buffer is considered because of the hunting activity and the potential displacement of this user group from this area.

Overall, cumulative impacts to recreational use in the BCII PA would consist primarily of the displacement of hunters. This would occur throughout the life of this project. The increased road density, traffic, noise, and degradation of scenery would result in hunters moving to other locations to hunt. Other recreational use, such as automobile tours and wildlife viewers, would also relocate and use other areas. Displacement of hunters from the BCII PA may take place for more than 20 years (the estimated life of the project is 20 years).

4.17.1.9 Visual Resources

The AOI for visual resources would be areas in the visual range of the BCII PA. This can vary, and may include areas up to several miles from the proposed project because key observation points occur along the ridgeline that Wild Horse Road (BLM 3309) follows.

Existing visual qualities in the area have already been affected by natural gas development, including road construction and well development. Proposed and reasonably foreseeable development would add to visual impacts in the BCII PA. Increases in energy development would result in decreases in the visual quality of the landscape. This degradation of the visual resource would result in the area becoming less attractive to visitors and recreational users.

The mitigation measures described in Chapter 2 would reduce the visual impact of oil and gas development in this area, but visual impacts would still be high because they would dominate the viewshed as seen from primary roads within the BCII PA.

4.17.1.10 Cultural Resources

The AOI for cultural resources is the BCII PA. Proposed and future energy development has the potential to cumulatively impact the viewsheds of the Cherokee Trail. The BLM is currently working on a policy to mitigate the cumulative effect of energy development on historic trails such as the Cherokee Trail. Current mitigation procedures include a 0.25-mile buffer on each side of a historic trail.

4.17.1.11 Socioeconomics

The AOI for socioeconomics is Carbon County, and includes the communities of Rawlins and Baggs. Increased natural gas development in Carbon County would increase the cumulative impacts to housing and social services in the County. However, the small scale of the proposed project should not stress the County's housing and services. The proposed project would be completed before the ARPA is fully developed after issuance of the Atlantic Rim EIS Record of Decision. Additionally, the staff working on the Doty Mountain and Red Rim projects would likely work on this project. This means the proposed project would not require that new workers be brought into the area to complete the project. Approximately 16 to 36 full-time workers would be employed during the construction and drilling phase of the project.

The displacement of hunters, particularly those guided by outfitters, could cumulatively impact the Carbon County economy. Hunting revenue represents a large portion of the economy during the fall. If hunters and outfitters are displaced from BCII PA, they could relocate to another part of the ARPA not affected by natural gas activity. However, future proposed energy development in the ARPA may cause a greater loss of hunting opportunity that would adversely impact the local economy.

Overall, the current natural gas activity represents an important source of government revenue, employment, and retail sales. This is a beneficial cumulative impact of increasing natural gas development in Carbon County.

4.17.1.12 Transportation

The AOI for transportation is the IH 80 corridor in Carbon County and access roads to the BCII PA. CBNG development in the BCII PA may result in small traffic increases on IH 80 and access roads. However, these roads would be able to handle the increased traffic and no change to the level of service would occur. Even with increased future traffic volumes, the Wyoming Department of Transportation estimates that 2012 traffic at the IH 80 and Creston Junction access would increase less than 1% from current volumes (BLM 2005).

4.17.1.13 Health and Safety

The AOI for health and safety is the BCII PA. A potential exists for increased risks to workers and the public resulting from natural gas development activities and increased traffic. This increased risk would primarily occur during the construction and drilling phase of the project, when most of the activity would occur in the BCII PA. These impacts would be short-term and small. No additional cumulative impacts are expected from proposed energy development.

4.17.1.14 Hazardous Materials

The AOI for hazardous materials is the BCII PA. Cumulative impacts for hazardous materials would result from potential contamination of the area resulting from present and future energy development. This impact is reduced through adherence to BLM guidelines for the storage and handling of hazardous materials. With strict regulatory guidelines, no cumulative impacts resulting from improper handling of hazardous materials is expected to result from the proposed project.

4.17.1.15 Noise

The AOI for noise would be the BCII PA. Increased noise would result from construction activities and during operations, particularly at the compressor site. This introduction of noise from present and future energy activity has the potential in the short-term to displace wildlife, particularly greater sage-grouse and big game. In the long-term, if anthropogenic sources of noise do not exceed 10 dBA above natural ambient or background noises measured at an occupied lek, then sage-grouse may become acclimated to the noise and return to normal activity in the area. This noise level may be obtained through the use of mufflers or other proven methods to reduce or baffle sound originating from compressors and noise producing facilities.

5.0 CONSULTATION AND COORDINATION

5.1 CONSULTATION AND COORDINATION

An environmental analysis is prepared when a Federal government agency considers approving an action within its jurisdiction that may impact the human environment. An environmental analysis aids Federal decision makers by presenting information on the physical, biological, and social environment of a proposed project and its alternatives. The first step in conducting an environmental analysis that meets the requirements of NEPA is to determine the scope of the project, the range of action alternatives, and the impacts to be included in the document.

The CEQ regulations (40 CFR, Parts 1500-1508) require an early scoping process to determine the issues related to the Proposed Action and alternatives that the analysis should address. The purpose of the scoping process is to identify important issues, concerns, and potential impacts that require analysis. The results of the scoping process are used to focus the analysis on the issues and concerns identified for the proposed project, so that alternatives or mitigation considered can be responsive to the issues and concerns. Alternatives that are not technically or economically feasible or responsive to the issues and concerns are not considered further in the analysis.

The EA documenting the NEPA analysis conducted for the BCII PA was prepared by a third-party contractor working under the direction of, and in cooperation with, the lead agency for the project, BLM RFO in Rawlins, Wyoming.

5.2 PUBLIC PARTICIPATION

A scoping notice was prepared and submitted to the public by the BLM on June 14, 2001, requesting comments on the proposed Atlantic Rim Natural Gas Project. Scoping documents were sent out to the public listed on the BLM mailing list as well as organizations, groups, and individuals that requested a copy of the scoping document.

As part of the scoping process, the interim drilling programs proposed by the Proponents were included in the scoping notice. The scoping period ended on July 25, 2001. During preparation of the EA, the BLM and the consultant IDT have communicated with, and received or solicited input from, various Federal, State, County, and local agencies; elected representatives; environmental and citizen groups; industries; and individuals potentially concerned with issues regarding the proposed exploratory drilling activities. The contacts made are summarized in the following sections.

The following organizations and individuals either provided comment or were provided the opportunity to comment during the scoping period.

FEDERAL OFFICES

U.S. Bureau of Land Management, Wyoming State Office
U.S. Congresswoman Barbara Cubin
U.S. Senator Mike Enzi
U.S. Senator Craig Thomas
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service

STATE AGENCIES

Governor Dave Freudenthal
State Representatives
State Senators
State Engineer's Office
Wyoming Department of Environmental Quality
Wyoming Department of Transportation
Wyoming Game and Fish Department
Wyoming Oil and Gas Conservation Commission
Wyoming State Planning Coordinator

COUNTY GOVERNMENT

Carbon County Commissioners
Carbon County Planning Commission

MUNICIPALITIES

Mayor-Baggs
Mayor-Rawlins
Mayor-Wamsutter

NATIVE AMERICAN TRIBES

Northern Arapahoe Tribal Council
Shoshone Tribal Council
Ute Mountain Tribe
Ute Tribal Council
Shoshone-Arapahoe Joint Tribal Council
Uinta-Ouray Tribal Council

GRAZING PERMITTEES

Weber Ranch
Montgomery Livestock Company
Salisbury Livestock Company
Stratton Sheep Company
Three Forks Ranch Corporation
Sam Morgan
Mike Sheehan
Robert Orchard
H.B. Lee
Matt Weber
Espy Livestock
Jack Creek Land and Cattle Company
PH Livestock Company

LEASE AND ROW HOLDERS

Benson-Montin-Greer
KCS Mountain Resources, Inc.
Merit Energy Company
North Finn, LLC
P&M Petroleum Management
Stone & Wolf, LLC

LANDOWNERS

The scoping notice was sent to 111 landowners potentially affected by the proposal.

LOCAL MEDIA

Casper Star-Tribune
Rawlins Daily Times
Rock Springs Rocket Miner
Wyoming State Journal
Wyoming State Tribune/Eagle
Gillette News-Record
Northwest Colorado Daily News
KRAI- Craig, Colorado
KRAL- Rawlins
KRKK- Rock Springs
KSIT- Rock Springs
KTWO- Casper
KTWO TV- Casper
KUWR- University of Wyoming

OTHER AGENCIES, INDUSTRY REPRESENTATIVES, INDIVIDUALS, AND ORGANIZATIONS

Audubon Society
National Wildlife Federation
Wilderness Society
Carbon County Stockgrowers
The Nature Conservancy
Wyoming Association of Professional Archaeologists
Field Museum of Natural History, Department of Geology
Independent Petroleum Association of Mountain States
Montana Oil Journal
Murie Audubon Society
Petroleum Association of Wyoming
Sierra Club
Wyoming Far Bureau Federation
Wyoming Outdoor Council
Wyoming Public Lands Council
Wyoming Stockgrowers Association
Wyoming Wildlife Federation

Wyoming Woolgrowers Association
 Vern Brodsho
 Ivan Herold
 Little Snake River Conservation District

5.3 LIST OF PREPARERS

The following tables identify the core BLM IDT (**Table 5-1**) and the consultant IDT (**Table 5-2**) who were principally involved in preparing this EA.

Table 5-1
BLM Interdisciplinary Team EA Reviewers

Name	Responsibility
BLM Team	
Travis Bargsten	BLM IDT Lead/Surface Protection/HazMat
Dave Simons	NEPA/Planning
Pamela Murdock	Archeology/Cultural and Historical Protection
Krystal Clair	Visual Resources/Recreation
Bob Lange	Hydrology/Produced Water Disposal
Mark Newman	Geology/Paleontology
Susan Foley	Soils/Weeds/Vegetation
Andy Warren	Range Resources/Big Game
Frank Blomquist	Wildlife/Special Status Plants/Big Game
Janelle Wrigley	Pipelines/Rights-of-way
Susan Caplan	Air Quality
John Dull	Drilling Plan/Hydrocarbon Recovery/Geology
Mike Jensen	Road Design

Table 5-2
Consultant Interdisciplinary Team EA Preparers

Name	Affiliation	Area of Expertise and Responsibility
Principal Interdisciplinary Team		
Robert Belford	PBS&J	Project Manager
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Eric Sundberg	DR Griffin & Associates, Inc.	BCII Design
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MASTER SURFACE USE AND WATER MANAGEMENT PLAN (MSUP/WMP)

BROWN COW II POD

OPERATORS:
Warren E & P, Inc.
Anadarko E & P Company

Surface Use Program and Plan of Development for the subject wells listed below

Lease Number	Well Name	Location
WYW-029262	AR Federal 1491 11-2	NE SW 2-T14N-R91W
	AR Federal 1491 1-11	NE NE 11-T14N-R91W
	AR Federal 1491 7-11	SW NE 11-T14N-R91W
	AR Federal 1491 9-11	NE SE 11-T14N-R91W
WYW-0208269	AR Federal 1491 15-2	SW SE 2-T14N-R91W
WYW-131274	AR Federal 1491 3-11	NE NW 11-T14N-R91W
	AR Federal 1491 11-11	NE SW 11-T14N-R91W
	AR Federal 1491 15-11	SW SE 11-T14N-R91W
WYW-136207	AR Federal 1491 1-14	NE NE 14-T14N-R91W
	AR Federal 1491 3-14	NE NW 14-T14N-R91W
	AR Federal 1491 7-14	SW NE 14-T14N-R91W
	AR Federal 1491 9-14	NE SE 14-T14N-R91W

The MSUP contains surface operating procedures for the Operators' Federal Applications for Permits to Drill (APDs), as required under Onshore Order No. 1. Information on each Federal well is contained in the BLM APD Form 3160-3.

This MSUP is intended to serve as the application for the gas and water gathering lines, access roads to well locations, and electric distribution lines in the POD. Roads, gathering lines and electrical distribution lines will occupy an 80-foot wide common corridor. Roads will require a 50-foot wide disturbance. Gas-gathering and water-gathering lines will require a 20-foot wide disturbance and electric distribution lines a 10-foot wide disturbance. All disturbances located in the same corridor will overlap each other to the maximum extent possible, while maintaining sound construction and installation practices. In no case will the maximum disturbance width of the access road and parallel utility corridors exceed 80 feet. Where possible, roadways will be used as working space for installation of gathering lines. Please refer to the schematic for the layout of pipelines and roads.

An allocation meter will be used to measure raw produced gas volumes for each well in the POD. A sales meter will be located downstream of the final compressor and dehydration unit, at the compressor station, and will be used to measure dry salable-quality gas. A request for variance from Onshore Order No. 5, if needed, along with a description of the measurement equipment, will be submitted in a Sundry Notice if the wells are deemed producible.

During well testing associated with this project, natural gas, to the extent it is produced, will be vented or flared on-location in accordance with the applicable BLM Onshore Orders, Notices To Lessees, and WOGCC regulations, and authorized by the WOGCC and the BLM in Sundry Notices. During testing, produced water from the proposed wells will be transported to an approved injection well for disposal.

1. EXISTING ROADS AND TRAVELWAYS

The project area is accessible from Baggs, Wyoming, by traveling approximately 7.7 miles north on Highway 789. Turn right onto BLM Road 3309 for a distance of approximately 5.5 miles until entering the Browning Field operated by Anadarko E & P Company LP.

Maintenance of the roads used to access the well locations will continue until final abandonment and reclamation of the well locations occur. A regular maintenance program will include, but is not limited to, blading, ditching, culvert installation and cleanout, and gravel surfacing where excessive rutting or erosion may occur. The existing roads will be maintained in a safe and usable condition.

Culverts (a minimum of 18 inches in diameter) will be placed in the existing BLM roads as the need arises or as directed by BLM's Authorized Officer. (Refer to individual well area maps).

2. PROPOSED ACCESS ROUTES

Well Access (see Exhibit 1)

Well Name	Location	Approximate Access Road Length	Approximate Acreage of Disturbance
AR Federal 1491 11-2	NE SW 2-T14N-R91W	1,221 feet	1.4 acres
AR Federal 1491 1-11	NE NE 11-T14N-R91W	Existing Road	Existing road
AR Federal 1491 7-11	SW NE 11-T14N-R91W	4,089 feet	4.7 acres
AR Federal 1491 9-11	NE SE 11-T14N-R91W	1,320 feet	1.5 acres
AR Federal 1491 15-2	SW SE 2-T14N-R91W	2,319 feet	2.7 acres
AR Federal 1491 3-11	NE NW 11-T14N-R91W	2,451 feet	2.8 acres
AR Federal 1491 11-11	NE SW 11-T14N-R91W	162 feet	0.2 acres
AR Federal 1491 15-11	SW SE 11-T14N-R91W	3,418 feet	3.9 acres
AR Federal 1491 1-14	NE NE 14-T14N-R91W	300 feet	0.3 acres
AR Federal 1491 3-14	NE NW 14-T14N-R91W	3,222 feet	3.7 acres
AR Federal 1491 7-14	SW NE 14-T14N-R91W	1,563 feet	1.8 acres
AR Federal 1491 9-14	NE SE 14-T14N-R91W	1,424 feet	1.6 acres

New access roads have been sited to avoid areas susceptible to increased resource damage from the proposed project, such as areas of steep terrain or poor vegetative cover.

At the time of construction, it shall be ensured that centerline stakes are located intervisibly (at intervals no more than 100 feet distant) along the alignment of the proposed access road.

Newly constructed access roads will be crowned, ditched, and graveled. All equipment and vehicles will be confined to identified travel corridors and other areas specified in this MSUP. The access roads will be surfaced with an appropriate grade of aggregate or gravel to a depth of four inches before the drilling equipment or rig is moved onto the pad.

Unless otherwise exempted, free and unrestricted public access will be maintained on the access road. Access roads will be maintained in a safe and usable condition. A regular maintenance program will include, but is not limited to, blading, ditching, installing or cleaning culverts, and surfacing.

All existing and proposed access roads will be constructed to minimum standards for a BLM Resource Road, as outlined in BLM Manual 9113. The minimum travelway width of the road will be 14 feet with turnouts. No structure will be allowed to narrow the road top. The inside and outside ditch slope will be 4:1. Turnouts will be spaced at a maximum distance of 1,000 feet and will be intervisible.

Wing ditches will be constructed as deemed necessary to divert water from the road ditches as outlined in BLM Manual 9113 and the 10 erosion index shall be used. Wing ditches will be constructed at a slope of 0.5 percent to 1 percent.

Topsoil and vegetation will be windrowed to the side of the newly constructed access roads. After the roads are crowned and ditched, the topsoil will be pulled back onto the cut slopes of the road right-of-way so no berm is left at the top of the cut slope.

Drainage crossings on the access routes will utilize culverts. Culverts will be covered with a minimum of 12 inches of fill or one-half the diameter of the pipe, whichever is greater. The inlet and outlet will be set flush with existing ground and lined up in the center of the draw. Before the area is backfilled, the bottom of the pipe will be bedded on stable ground that does not contain expansive or clay soils, protruding rocks that would damage the pipe or unevenly sized material that would not form a good seat for the pipe. The site will be backfilled with unfrozen material and rocks no larger than two inches in diameter. Care will be exercised to thoroughly compact the backfill under the haunches of the conduit. The backfill will be brought up evenly in 6-inch layers on both sides of the conduit and thoroughly compacted. A permanent marker will be installed at both ends of the culvert to help keep traffic from running over the ends. Culverts will be installed in a manner that minimizes erosion or head-cutting and may include rip rapping or other measures as required. Additional culverts will be placed in the access road as the need arises.

The access roads will be winterized by providing a well-drained travelway to minimize erosion and other damage to the roadway or the surrounding public land. Construction activity or routine maintenance will not be conducted using frozen or saturated soil material or during periods when watershed damage is likely to occur.

No construction or routine maintenance activities will be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess

of four inches deep, the soil will be deemed too wet to adequately support construction equipment, and construction and maintenance will be temporarily suspended.

The written approval of the Authorized Officer will be obtained before snow removal is undertaken outside the new and existing roadways. If approval is given, equipment used for snow removal operations outside the road ditches will be equipped with shoes to keep the blade off the ground surface. Special precautions will be taken where the surface of the ground is uneven to ensure that equipment blades do not destroy the vegetation.

If drilling is productive, all access roads to the well site would remain in place for well servicing (such as maintenance and improvements). Any portions of the ROW for the access road that are no longer needed would be reclaimed. The outside ditch cuts would be seeded and reclaimed.

3. LOCATION OF EXISTING WELLS

The enclosed **Exhibit 1** shows locations of disposal, drilling, producing, injection, and abandoned oil and gas wells within one mile of the Brown Cow II POD wells.

4. LOCATION OF EXISTING AND/OR PROPOSED FACILITIES, IF WELLS ARE PRODUCTIVE

On Well Pad

Wellhead facilities would be installed if the wells are productive. Natural gas and produced water would be collected and transported from the wellhead via buried pipelines.

The long-term surface disturbance at the location of each productive well would encompass approximately 0.25 acre, including cut and fill slopes. Typically, only the production facilities at the well site would be fenced or otherwise removed from existing uses. A loop road or a small, graveled pad area would provide a safe turnaround area for vehicles.

The wellhead facilities would be contained within an area covering approximately 15 feet by 15 feet. The surface equipment at each well will consist of the wellhead, a pump panel, and an insulated wellhead cover. Additionally, a vertical separator at some well sites would separate gas from the water stream. Each productive well is expected to require installation of a progressing cavity pump below ground level, which will be used to produce water necessary to lower pressure within the coal seams.

All production facilities installed on location that have the potential to leak or spill oil, glycol, produced water, or other fluid, which may constitute a hazard to public health or safety, shall be placed within an appropriate containment or diversionary structure sufficient to hold at least 110% of the largest container within the facility. The structure shall be impervious to oil, glycol, produced water, or other hazardous fluid for at least 72 hours. It shall be installed so that any spill or leakage would not drain infiltrate, or otherwise escape to ground water, surface water, or navigable waters before cleanup is completed.

The Operators will paint structures at wells and central facilities with flat colors that blend with the adjacent undisturbed terrain. The paint used will be a color specified by the BLM. This

measure does not apply to structures that require safety coloration in accordance with the requirements of the Occupational Safety and Health administration (OSHA). Due to the presence of two predominant background colorations in the project area, one of two site-specific colors to be specified by the BLM will be used in painting above-ground facilities. The BLM will specify which of the two colors applies to each APD authorization or subsequent Sundry Notice approval.

Off Well Pad

Pipelines (Gathering Lines and Delivery Pipeline)/Compressor Station/ Water Handling and Disposal Facilities/Injection Wells/Tanks (see Exhibit 1)

Electricity would be used to power pumps during well development and to initiate and maintain production. A centrally located natural gas powered electrical generator located at the compressor station will be utilized to provide electricity to the wells. The electrical distribution system will consist of utility lines buried in the road/pipeline corridor. These lines would be installed in trenches approximately three feet deep.

Pipelines

The corridors for the gathering systems will parallel access roads. ROWs located in the same corridor will overlap each other to the maximum extent possible, while maintaining sound construction and installation practices. The working space for installation of facilities will be along the road.

Clearing along the pipeline route shall be limited to removal of above ground vegetative parts within the area comprising the ditch and backfill.

Trenches will be excavated to install the gas and water flowlines and electrical distribution lines. (Refer to the attached schematic for layout of lines) Trenches excavated for well gathering lines and electrical lines (which would require ROWs of 20 feet in width for gas lines and water lines, and 10 feet in width for electrical lines) would be reclaimed as soon as practical after trenching and backfilling are completed. About 4.5 miles of gathering lines would be constructed within the POD.

A gas-gathering pipeline system (low pressure) would be constructed from the wellheads to the compressor station. This system would use high-density polyethylene (HDPE) pipe, starting with 4-inch diameter pipe at the wellhead and graduating up to 20-inch diameter pipe at the inlet to the compressor. Although there is no plan to use additional area for installation of the larger size pipe, should additional pipeline corridor right-of-way width be required on Federal land, application will be made to the BLM.

A produced water-gathering pipeline system (low pressure) would be constructed from the wellheads to the centralized facilities for injection. This network of water lines would use 4-inch through 20-inch diameter pipe made of HDPE. Although there is no plan to use additional area for installation of the larger size pipe, should additional pipeline corridor right-of-way width be required on Federal land, application will be made to the BLM.

Pipeline corridors would be reclaimed as soon as practical after construction of the pipeline is complete, but within no longer than one year from the date construction is completed.

Where it is necessary to remove above ground vegetation, the top 6-inches of top soil material will be stripped, windrowed, and stockpiled to the side and segregated if the pipeline to be installed is 8-inches or greater, outside diameter. Top soil material will not be mixed or covered with subsurface material. After construction cut and fill slopes will be waterbarred or regraded to conform to the adjacent terrain as specified by BLM.

A maximum of 2,000 feet unattended or unprotected open trench shall be allowed at any given time. Construction trenches and other openings left overnight shall be covered or sloped for easy egress. Covers shall be secured in place and strong enough to prevent livestock or wildlife from falling through. During the period when a trench is open, warning devices, such as signs or warning lights shall be posted to warn the public of the hazard.

Drainage crossings shall be constructed to prevent any blocking, diversion, or restriction of the existing channel. Material removed shall be stockpiled for use in reclamation of the crossing. Drainage crossings shall be left in a geometry similar to what existed prior to disturbance, compacted, and capable of passing water without accelerated erosion.

In order to minimize surface disturbance, the operator will use wheel trenchers (ditchers) or ditch witches, where possible, to construct all pipeline trenches associated with this project. Track hoes or other equipment will be used where topographic or other factors require their use. Trenches shall be compacted during backfilling.

Construction-related traffic shall be restricted to approved routes. Cross-country vehicle travel shall not be allowed.

No hydrostatic testing water shall be discharged to the surface.

Water Handling and Disposal Facilities and Injection Wells

Within 90 days of initial production start-up, the operator will submit an analysis of the produced water to the BLM's Authorized Officer. Approval of this POD includes approval by Onshore Order No. 7 to dispose of produced water. Produced water will be injected into water disposal wells authorized by the State of Wyoming, and by the BLM, if necessary. Any changes in the produced water disposal method or location must receive written approval from BLM's Authorized Officer before the changes take place.

Produced water from individual wells would be gathered and routed to central storage facilities located next to the injection wells. Produced water-gathering pipelines would be constructed along the well access road, from the wellhead to the injection facilities.

Five deep injection wells would be approved by the BLM, WOGCC, and WDEQ (locations are shown in Figure-2-1). The approximate maximum injection capacity of the five injection wells would be 22,500 barrels per day (bbls/day).

Deep Injection Wells		
WYW-0208269	API 49-007-20978	SE SE 2-T14N-R91W
WYW-0208269	API 49-007-20750	SW NW 12-T14N-R91W
WYW-0208269	API 49-007-20980	W NE 12-T14N-R91W
WYW-0208269	API 49-007-21052	NE NE 2-T14N-R91W
ST 93-00078	API 49-007-21513	SW SE 36-T15N-R91W

5. LOCATION AND TYPE OF WATER SUPPLY FOR DRILLING

Water to drill the first well will be trucked from the Brown Cow POD water facilities located in Section 1 T14N R91W (Browning 2-1). Other possible sources of water are as follows:

- P154548W Brown Cow Fed 43-2-1491 Section 2 T14N R91W
- P154538W Brown Cow Fed 14-1-1491 Section 1 T14N R91W

Water for use in drilling the subsequent wells will be obtained from existing wells completed in the coal seams of the Mesaverde Group. Approximately 700 barrels of water (almost 30,000 gallons) will be needed to drill each well. The actual volume of water used in drilling operations will depend on the depth of the well and any losses that might occur during drilling.

Any changes in the water source or method of transportation must receive written approval from BLM's Authorized Officer before the changes take place.

6. CONSTRUCTION MATERIALS

Construction materials (mineral material aggregate suitable for surfacing material) will be purchased from a nearby private source or a local supplier having a permitted source of materials in the area. No construction materials will be removed from federal and/or Indian lands without prior approval from the BLM.

7. METHODS FOR HANDLING WASTE DISPOSAL

Drill cuttings (rock fragments generated during drilling) will be produced during drilling of the borehole. Cuttings will be buried in the reserve pit upon closure of the reserve pit.

No oil or other oil-based drilling additives, chromium/metals-based muds, or saline muds will be used during drilling of these wells. Only fresh water, biodegradable polymer soap, bentonite clay, and non-toxic additives will be used in the mud system. Should unexpected liquid petroleum hydrocarbons (crude oil or condensate) be encountered during drilling or well testing, all liquid petroleum hydrocarbons will be contained in test tanks on the well site.

A portable, self-contained chemical toilet will be provided on location during drilling and completion operations. Upon completion of operations, or as required, the contents of toilet holding tanks will be disposed of at an authorized sewage treatment and disposal facility.

Disposal will be in accordance with State of Wyoming, Carbon County, and BLM requirements regarding sewage treatment and disposal. The Operators will comply with all state and local laws and regulations pertaining to disposal of human and solid wastes.

No trash will be placed in the reserve pit. All refuse (trash and other solid waste including cans, paper, cable, etc.) generated during construction, drilling, and well testing activities will be contained in an enclosed receptacle, removed from the drill locations promptly, and hauled to an authorized disposal site.

Immediately after removal of the drilling rig, all debris and other waste materials not contained within trash barrels will be cleaned up and removed from the well location. No potentially adverse materials or substances will be left on the drill locations.

Hazardous Materials Management

All project-related activities involving hazardous materials will be conducted in a manner that minimizes potential environmental impacts. An on-site file will be maintained containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds, or substances that are used in the course of construction, drilling, completion, production, and reclamation operations. Netting will be placed over any pits that may contain hazardous substances (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 101(14)), as determined by visual observation or testing. The mesh diameter shall be no larger than 1 inch.

No hazardous substance, as defined by CERCLA, will be used in the construction or drilling operations associated with these wells. No Resource Conservation and Recovery Act (RCRA) hazardous wastes will be generated by well-drilling operations. The term “hazardous materials” as used here means: (1) any substance, pollutant, or containment (regardless of quantity) listed as hazardous under CERCLA of 1980, as amended 42 U.S.C. 9601 et seq., and the regulations issued under CERCLA; (2) any hazardous waste as defined in RCRA of 1976, as amended; and (3) any nuclear or nuclear byproduct as defined by the Atomic Energy Act of 1954, as amended, 42 U.D.C. 2001 et seq. The operator will be required to provide a referenced list of hazardous materials that could be used, produced, transported, disposed of, or stored on the well location including a discussion on the management of the hazardous materials. Releases of hazardous materials will be reported to the BLM within 24 hours of discovery. If a release involves petroleum hydrocarbons or produced water, the Operators will comply with the notification requirements of NTL-3A.

Any spills of oil, gas, or any other potentially hazardous substance will be reported immediately to the BLM, landowner, local authorities, and other responsible parties and will be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.

8. ANCILLARY FACILITIES

Several self-contained travel-type trailers may be used onsite during drilling operations. No facilities other than those described in this MSUP will be constructed to support the operations associated with the wells. The trailers will be located entirely on previously-disturbed areas constructed for the drilling of the POD wells.

9. WELL SITE LAYOUT

Information on each federal well is contained in the BLM APD Form 3160-3 and the pad cut and fill diagram (**Exhibit 2**) on file with BLM. The cross section shows the orientation of the drill pad with respect to the topographic features (cut and fill), facilities, and access to the pad.

At each drill location, surface disturbance will be kept to a minimum. The areal extent of each drill pad is approximately 300 feet by 200 feet, not including cut and fill slopes. Cut and fill slopes are displayed for each well location on **Exhibit 2**. Deviation from the dimensions, cut and fill slopes, or orientation of the well pads will require prior written approval from the BLM. Each drill pad will be leveled using cut and fill construction techniques. Prior to constructing the drill pad the top 6 inches of soil and associated vegetative material will be removed and stockpiled. A water diversion ditch may be constructed around the up slope side of the well pad to divert storm water away from each pad, if necessary. No spoil material shall be pushed into drainages.

Each reserve pit will be approximately 10 feet deep (including two feet of freeboard), and will be 35 feet wide and 100 feet long (at the surface). Each pit will be excavated within the “cut area” of the drill site to minimize any potential for slope failure. Each pit will be designed to prevent collection of surface runoff and will be closely monitored to ensure no pit overflows occur. The reserve pit will be open for an estimated 8 to 12 weeks to allow for evaporation of pit fluids. During this time the pit will be closed off from wildlife and livestock by two strands of barbed wire above a 32-inch woven wire fence. The reserve pit will be fenced on three sides during drilling, and the working side will be fenced immediately after the drilling rig is moved. Fencing will meet the following specifications.

The woven wire shall be no more than four inches above the ground. The first strand of barbed wire shall be about three inches above the woven wire. Total height of the fence shall be at least 42 inches.

Corner posts shall be cemented and/or braced in such a manner to keep the fence tight at all times. Standard steel, wood, or pipe posts shall be used between the corner braces. The maximum distance between any two posts shall be no greater than sixteen feet. All wire shall be stretched using a stretching device before it is attached to the corner posts.

Netting will be placed over any pits that have been identified as containing oil, as determined by visual observation or testing. The mesh diameter will be no larger than 1 inch. For the protection of livestock and wildlife, all pits and open cellars will be fenced. Fencing shall be in accordance with BLM specifications.

10. PROGRAMS FOR RECLAMATION OF THE SURFACE

Interim reclamation including pit evaporation, fluid removal, pit solidification, recontouring, ripping, spreading top soil, seeding, and/or weed control will be performed as soon as possible after drilling operations are completed, but within no more than one year from the date completion operation have been completed.

As soon as practical after the conclusion of drilling and testing operations, unproductive drill holes will be plugged and abandoned and site and road reclamation will commence. In no case will reclamation at unproductive locations be initiated later than two years from the date a well is plugged. A joint inspection of the disturbed area to be reclaimed may be requested. The primary purpose of this inspection shall be to review the existing, or agree upon a revised final reclamation and abandonment plan. The BLM will be notified prior to commencement of reclamation operations. A Notice of Intent to Abandon will be filed for final recommendations regarding surface reclamation. Upon successfully completing reclamation of a plugged & abandoned location, a Final Abandonment Notice (FAN) will be submitted to the BLM.

After abandonment of nonproductive wells, all wellhead equipment that is no longer needed will be removed, and the well sites will be restored.

Any areas, including the drilling locations, reserve pits, or access routes, that are disturbed by earthwork will be recontoured to a natural appearance as near to the original contour as possible as soon as practical after the conclusion of operations. Any flowline trenches that may be constructed will be backfilled completely.

Pits containing drilling mud and fluids shall be allowed to dry. Fluids remaining after two years shall be moved to an approved site. Other options, if approved by the Authorized Officer, may include fly-ash solidification or sprinkler evaporation over the pit containing the fluid.

The reserve pit, upon being allowed to properly dry, shall be backfilled and compacted with a minimum cover of five feet of soil, void of any topsoil, vegetation, large stones, rocks or foreign objects. Soils that are moisture laden and saturated, partially or completely frozen shall not be used for backfill or cover. The pit area shall be mounded to allow for settling and to promote positive surface drainage away from the pit.

Should the well become productive, all disturbed areas not needed for production operations shall be re-contoured and re-vegetated as outlined in the MSUP, under an interim or temporary reclamation plan. This shall be performed as soon as possible after placing the well into production, but no longer than within two years of completion of drilling. If not previously reclaimed, the access road and pipeline right-of-way may be included in this reclamation. Re-contouring involves bringing all construction material from cuts and fills back onto the well pad and site, and reestablishing the natural contours where desirable and practical. Fill and stockpiled soil no longer needed or necessary to the operation shall be spread on the cut slopes and covered with stockpiled topsoil. Final contouring shall blend with and follow as closely as possible the natural terrain and contours of the original site and surrounding areas. The production pad and facilities shall occupy as small an area as possible, but not larger than 0.32-acre unless otherwise approved by the BLM Authorized Officer.

Should the well be put into production or upon final abandonment of the well, fencing of the reseeded well site may be erected to exclude grazing and to help vegetation success.

After recontouring the site to the original contour that existed prior to pad construction, final grading and replacement of topsoil over the entire surface of the well site and access road will be conducted. The area will be ripped to a depth of 18-24 inches on 18-24-inch centers.

The surface soil material shall be pitted with small depressions to form longitudinal depressions 12-18 inches deep. The entire area will be uniformly covered with the depressions constructed perpendicular to the natural flow of water.

The travelway of access roads designated by the BLM to be rehabilitated will be ripped to a depth of 18 inches, recontoured to approximate the original contour of the ground and seeded in accordance with the reclamation portions of the MSUP.

Water control structures will be designed and constructed at drainage crossings to prevent excessive erosion within the drainage.

Waterbars will be constructed on all disturbed areas to: (1) simulate the imaginary contour lines of the slope with a grade of 1-2 percent; (2) drain away from the disturbed areas; and (3) begin and end in undisturbed vegetation or soil.

Recontoured areas will be graded to be outsloped, and waterbreaks will be constructed where needed to avoid concentrating surface waters and producing gullies. The land surface will be left “rough” after recontouring to ensure that the maximum surface area will be available to support the reestablishment of vegetative cover.

All topsoil conserved during earthwork will be redistributed evenly and left “rough” over these recontoured areas. BLM goals for vegetative cover will guide revegetation efforts. Common goals are erosion control, weed control, palatable and nutritious forage for livestock and wildlife, and visual aesthetics.

Seeding will occur in the fall after September, prior to ground frost, or in the spring after frost has left the ground. Seed mixes appropriate to the native plant community shall be used for revegetation. The specific seed mix for each well location and road segment will be provided by the BLM in each APD authorization or subsequent sundry notice, and shall be appropriately followed in implementing interim and final reclamation for this project.

Interim reclamation revegetation success criteria include the attainment of 50% of pre-disturbance vegetation cover in three years and 80% of pre-disturbance vegetation cover in five years. Additionally, the reclaimed area should be comprised of at least 20% of the species contained in the seed mix and/or present on adjacent, undisturbed area. No single species should account for more than 50% of the total vegetative cover unless similar to adjacent, undisturbed areas. Noxious weeds will be controlled.

The operator will erect snow fencing or other suitable structures for the capture of snow on specified locations and for the minimization of wind scouring on erosive sites.

11. SURFACE OWNERSHIP

U.S. Bureau of Land Management
Rawlins Field Office
1300 North Third
Rawlins, Wyoming 82301-2407
(307) 328-4200

12. OTHER INFORMATION

The Operators are the lessee or operator for the Federal oil and gas leases associated with this MSUP and these APDs.

The Operator shall maintain a hazardous materials, oil and gas release contingency response plan that applies to the project, and shall provide the BLM with a copy of the current plan and any subsequent changes made to the plan.

No slopes in excess of 25 percent would be affected by this proposal. No activities are planned near existing highways, railroads, pipelines, or powerlines. There are no occupied buildings or residences within one-quarter mile of the proposed drill sites.

Any road crossings of dry drainages, riparian, or other wetland areas will use appropriate Best Management Practices (BMP) to minimize impacts to these areas.

Dust abatement using produced water will comply with all applicable WOGCC, WDEQ or BLM requirements. Only water suitable for livestock use would be used for dust abatement. Only disturbed areas will be sprayed. Spraying will be done to reduce runoff and channeled flow.

The presence, distribution, and density of noxious weeds in the project area will be monitored by the Operators. The well access roads and well pads will be inspected regularly to ensure that noxious weeds do not become established in newly disturbed areas. Control methods will be based on available technology, taking into consideration the weed species present. Methods of noxious weed control may include revegetation of disturbed areas to reduce the potential for and success of weed establishment, mowing, hand-pulling, or application of appropriate herbicides. The control methods shall be in accordance with guidelines established by the Environmental Protection Agency (EPA), BLM, and state and local authorities or agencies.

Prior to the use of any herbicides or pesticides on Federal lands, the Operators will obtain written approval from the BLM Authorized Officer. The Operators will also prepare and submit a proposal and plan to the BLM Authorized Officer for an annual weed control program that satisfies the requirements established in the MSUP and any additional Conditions of Approval.

A cultural/historical resource inventory has been conducted on the public lands by a qualified archaeologist permitted in Wyoming by the BLM. The findings have been submitted under separate cover. Any additional areas of potential effect identified subsequent to the completion of these reports will be inventoried as specified by the BLM, and a supplemental report will be prepared.

During the construction phase of the well pad and access road, the operator shall have onsite, a qualified inspector other than the dirt contractor to serve as Compliance Coordinator. This individual will be responsible for assuring that all requirements of the MSUP and appropriate Conditions of Approval are enforced.

Approved facilities no longer included within the lease-unit boundaries due to a change in the lease or unit boundary will be authorized with a right-of-way.

The Operators will be responsible for the prevention and suppression of fires on public lands caused by its employees, contractors, or subcontractors. During conditions of extreme fire danger, surface use operations may be either limited or suspended in specific areas, or additional measures may be required by the Authorized Officer.

13. WILDLIFE

1. During reclamation, the Companies will establish a variety of forage species that will return the land to a condition that approximates its state before disturbance. In the short term, grasses and forbs will be established and in the long term, shrub species will establish themselves naturally.
2. The Companies will prohibit unnecessary off-site activities of operational personnel near the drill sites. The Companies also will inform all project employees of applicable wildlife laws and penalties associated with unlawful take and harassment.
3. Construction will not be allowed during critical nesting season (February 1-July 31) near active raptor nests. Seasonal timing restrictions within a “buffer zone” around nests to avoid disturbance to nesting raptors will reduce impact from construction activities. Exception requests may be granted if nests are found to be inactive or modified if there is visual screening of the nest that is determined by the BLM to be sufficient to minimize impacts.
4. Surface disturbing activities will not be allowed within 0.25 mile of identified active or occupied greater sage grouse leks.
5. The Companies will protect greater sage grouse nesting habitat during the breeding, egg-laying, incubation and early brood-rearing period (March 1 through June 30) by restricting construction within a two-mile radius of active leks for greater sage grouse. Exceptions may be granted if the activity will not interfere with greater sage grouse nesting activity.
6. Construction activities in potential mountain plover nesting habitat during the nesting period (April 10-July 10) will not be allowed unless an exception is granted. An exception may be granted if a survey for mountain plovers is conducted, within areas of potential habitat, prior to any surface disturbance in those areas, according to current mountain plover survey protocol and no plovers are found (USDI-FWS 2002).
7. All pits and open cellars must be fenced for the protection of wildlife and livestock. Fencing must be in accordance with BLM specifications. Netting must be placed over all production pits to eliminate any hazard to migratory birds or other wildlife. Netting is also required over reserve pits that have been identified as containing oil or hazardous substances (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 101 (14)), as determined by visual observation or testing. The mesh diameter will be no larger than one inch.

14. LESSEE’S REPRESENTATIVE AND CERTIFICATIONS

Representatives for Anadarko E & P Company

Name: Cathy Flansburg
Title: Senior Environmental and Regulatory Analyst
Address: 2515 Foothill Boulevard, Suite 300
City/State/Zip: Rock Springs, WY 82901
Phone: (307) 352-3328

Name: Gary Sundberg
Title: Permit Agent for Anadarko E&P Co., LP
Address: P.O. Box 94
City/State/Zip: Rawlins, Wyoming 82301
Phone: (307) 321-2445

Bonding

BLM Nationwide Bond, WYB-000269

Certification

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill sites and access routes; that I am familiar with the conditions which currently exist; that the statements made in this plan are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed by AEPC and its contractors and subcontractors in conformity with this plan and the terms and conditions under which it is approved. This statement is subject to the provisions of 18 U.S.C 1001 for the filing of a false statement.

I also certify that AEPC will comply with the provisions of the law or the regulations governing the Federal or Indian right of reentry to the surface under 43 CFR 3814.

I also certify that AEPC has reached or will reach an agreement with the surface owner(s) and surface lessee(s) regarding the requirements for the protection of surface resources and reclamation of disturbed areas and/or damages in lieu thereof, or if an agreement cannot be reached, will comply with the provisions of the law or the regulations governing Federal or Indian right of reentry to the surface under 43 CFR 3814.

I also certify that:

- A. All potentially affected landowners having properly permitted water wells with the WSEO within each producible well’s Circle of Influence (0.5-mile radius) will be offered a Water Well Agreement; and
- B. If a Water Well Agreement is not reached with the landowner, AEPC agrees to mitigate the impacts of its producible wells in accordance with State of Wyoming water laws; and

- C. Permits to Appropriate Groundwater have been applied for from the Wyoming State Engineer's Office, concurrently with these Applications for Permits to Drill.

I also certify that AEPC shall use its best efforts to conduct its approved operations in a manner that avoids adverse effects on any properties which are listed, or may be eligible for listing, in the National Register of Historic Places (NRHP). If historic or archaeological materials are uncovered during construction, the operator will immediately stop work that might further disturb such materials, and contact the authorized officer (or his/her representative) at the BLM Rawlins Field Office. Any paleontological resources or fossils discovered as a result of operations associated with these wells will be brought to the attention of the authorized officer or his/her representative immediately. All activities in the vicinity of such discoveries will be suspended until notified to proceed by the Authorized Officer.

I also certify that AEPC shall use its best efforts to conduct its approved operations in accordance with the Project-wide Mitigation Measures and procedures outlined in Chapter 2 of the Environmental Assessment (EA) for this project.

By: _____ Date: _____

Gary Sundberg

Permit Agent for Anadarko E & P Company

BROWN COW II POD

OPERATORS:

Warren E & P, Inc.

Anadarko E & P Company

List of Exhibits:

Exhibit 1 (A): Overall project map

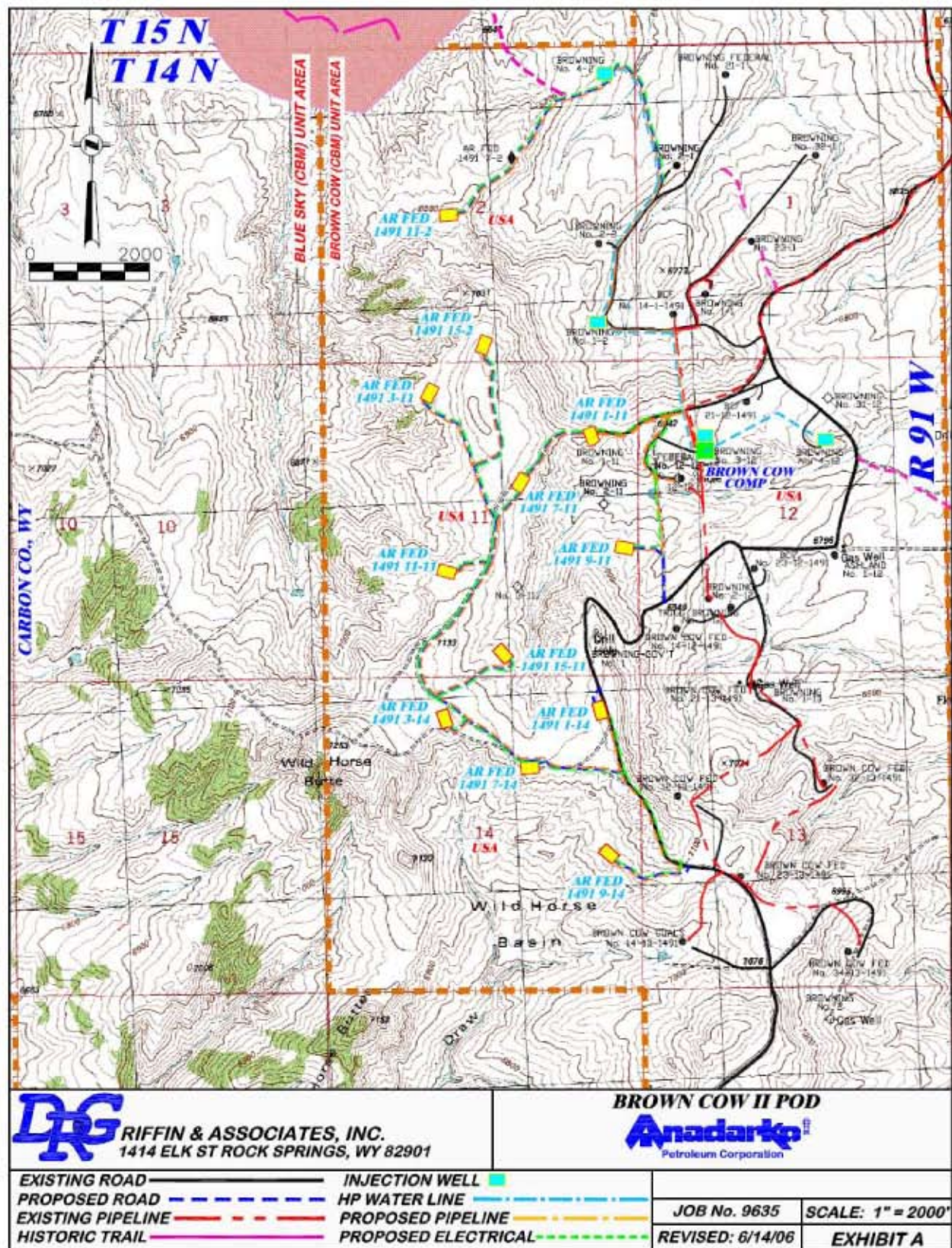
Exhibit 2: Pad cut & fill diagram

Exhibit 3: Access road plan & profile

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Exhibit 1
Overall Project Map

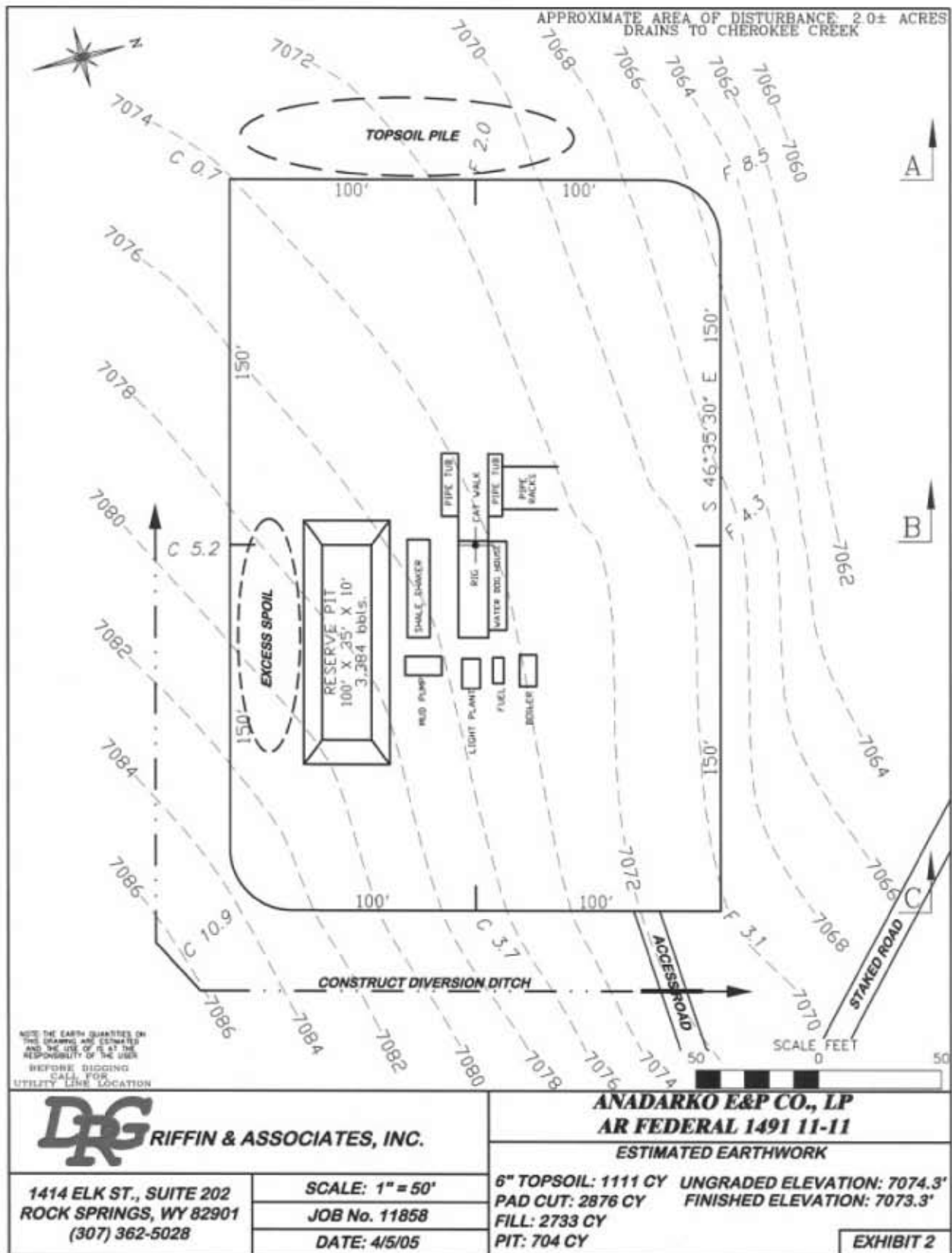
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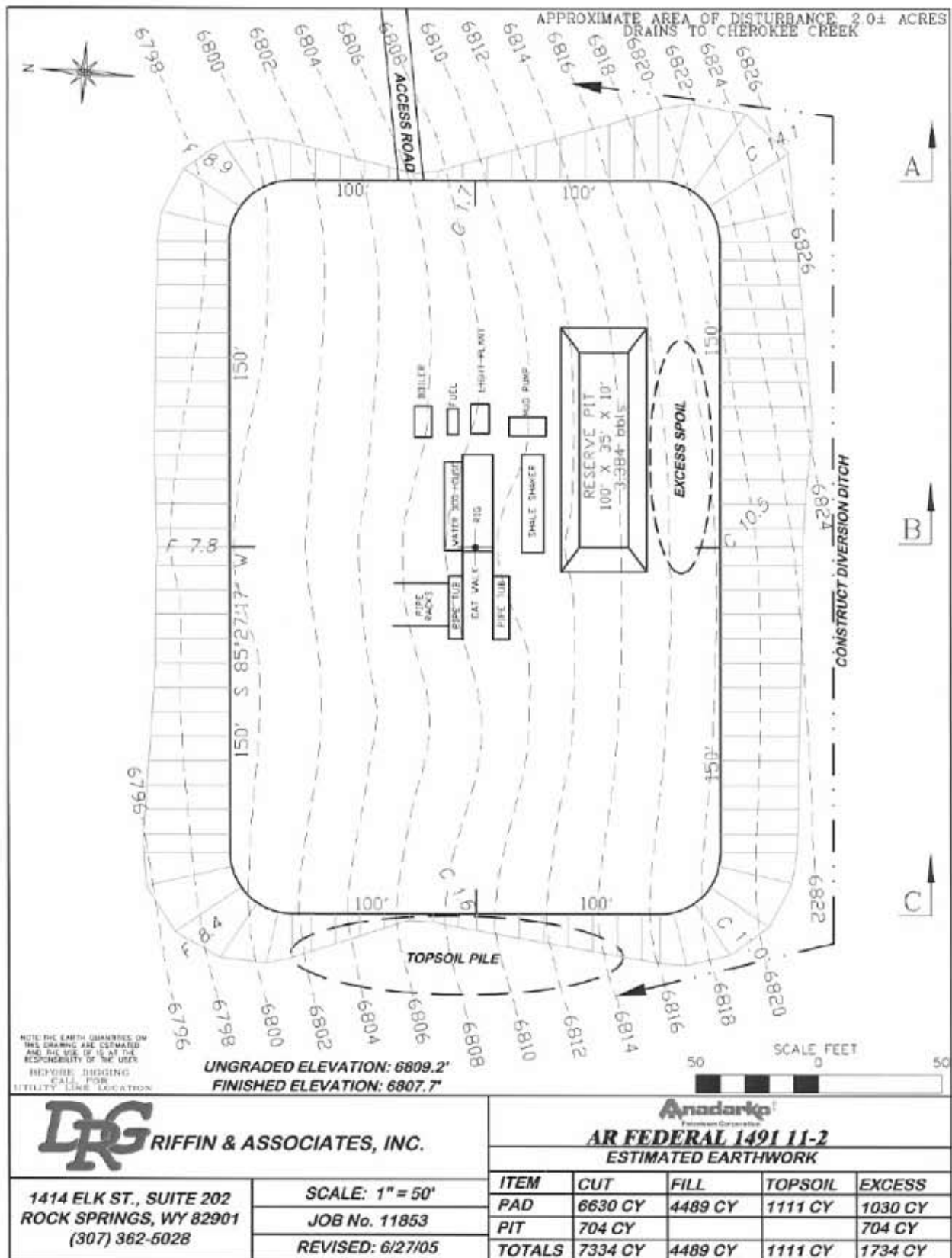


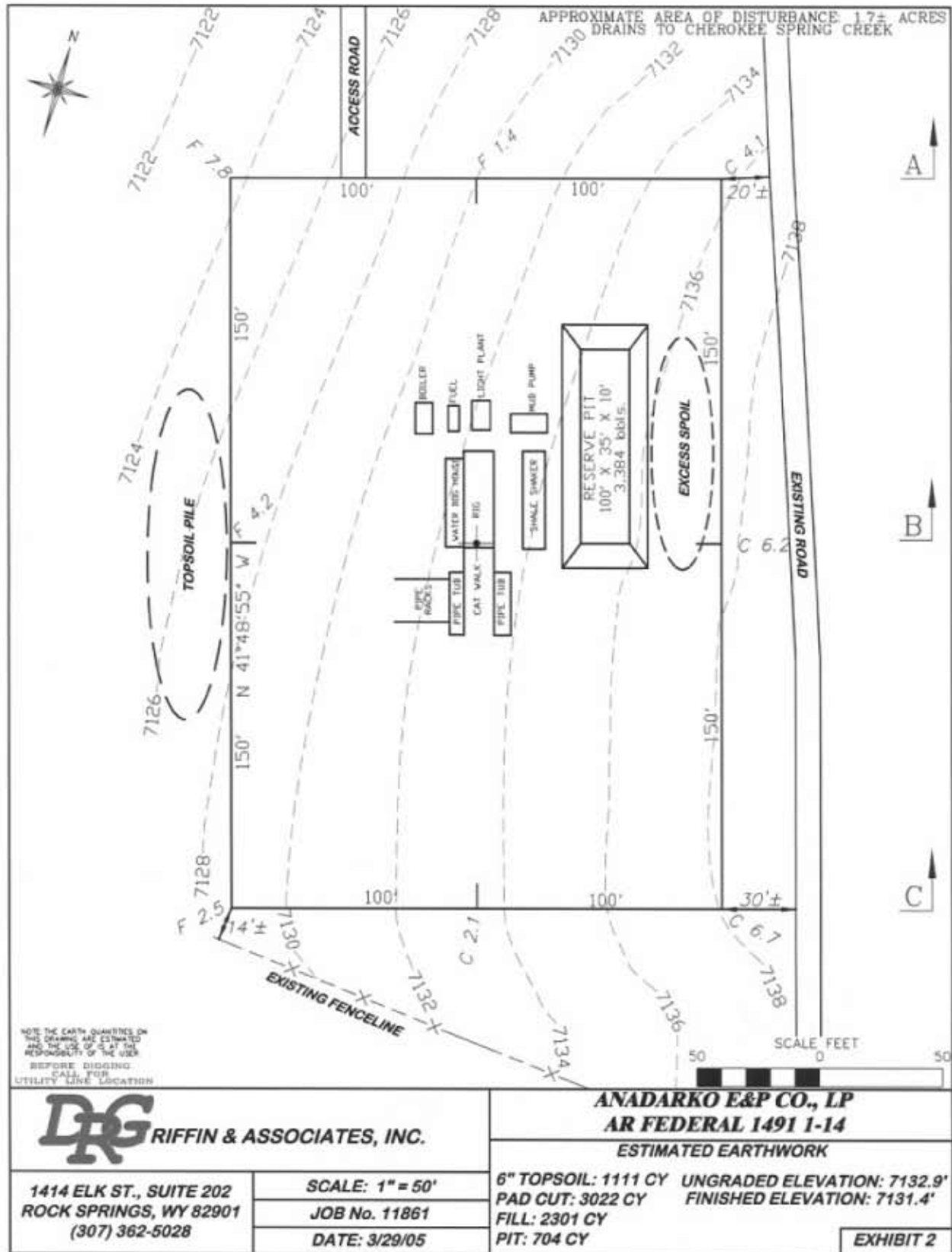
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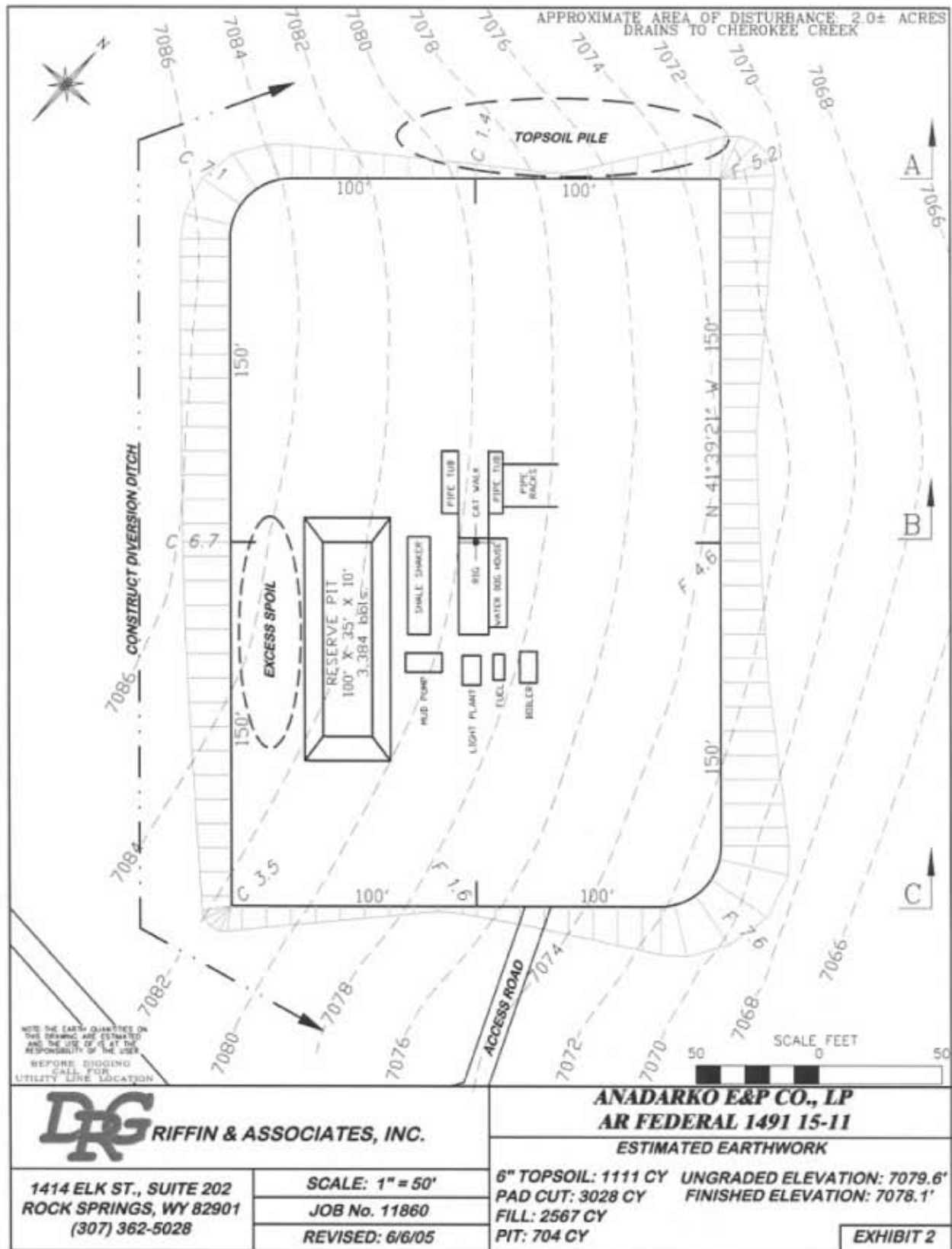
Exhibit 2
Pad Cut and Fill Diagrams

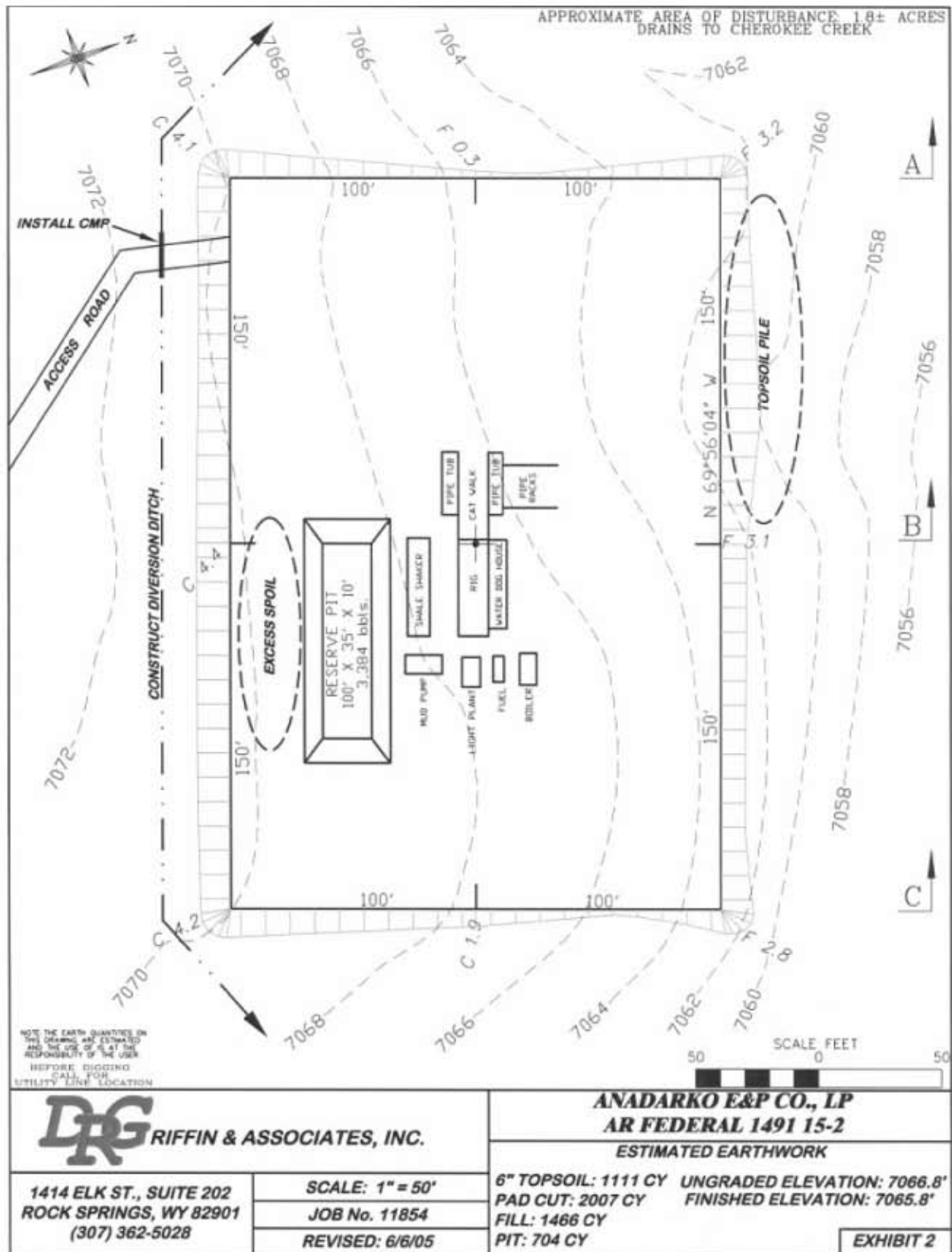
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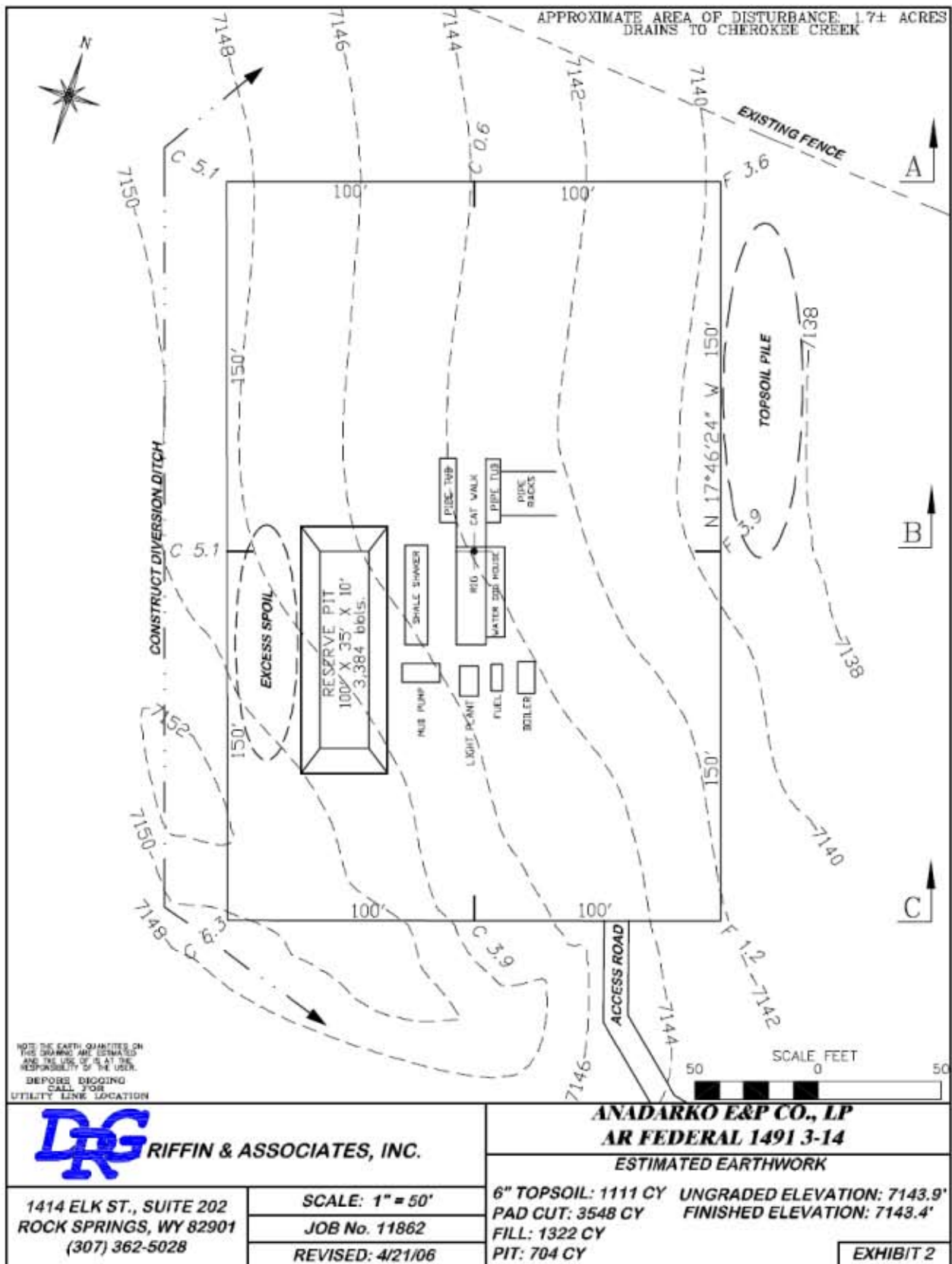


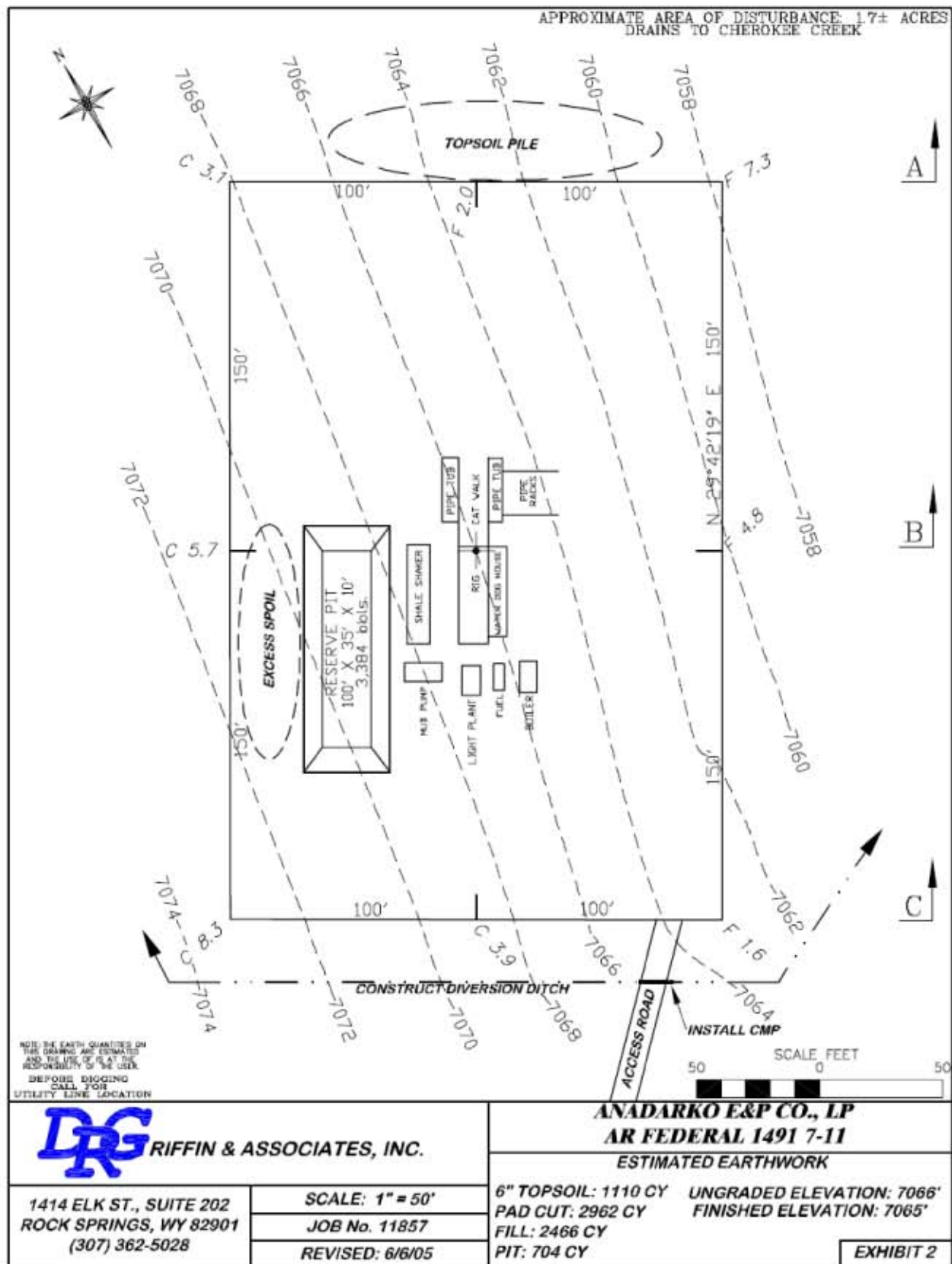


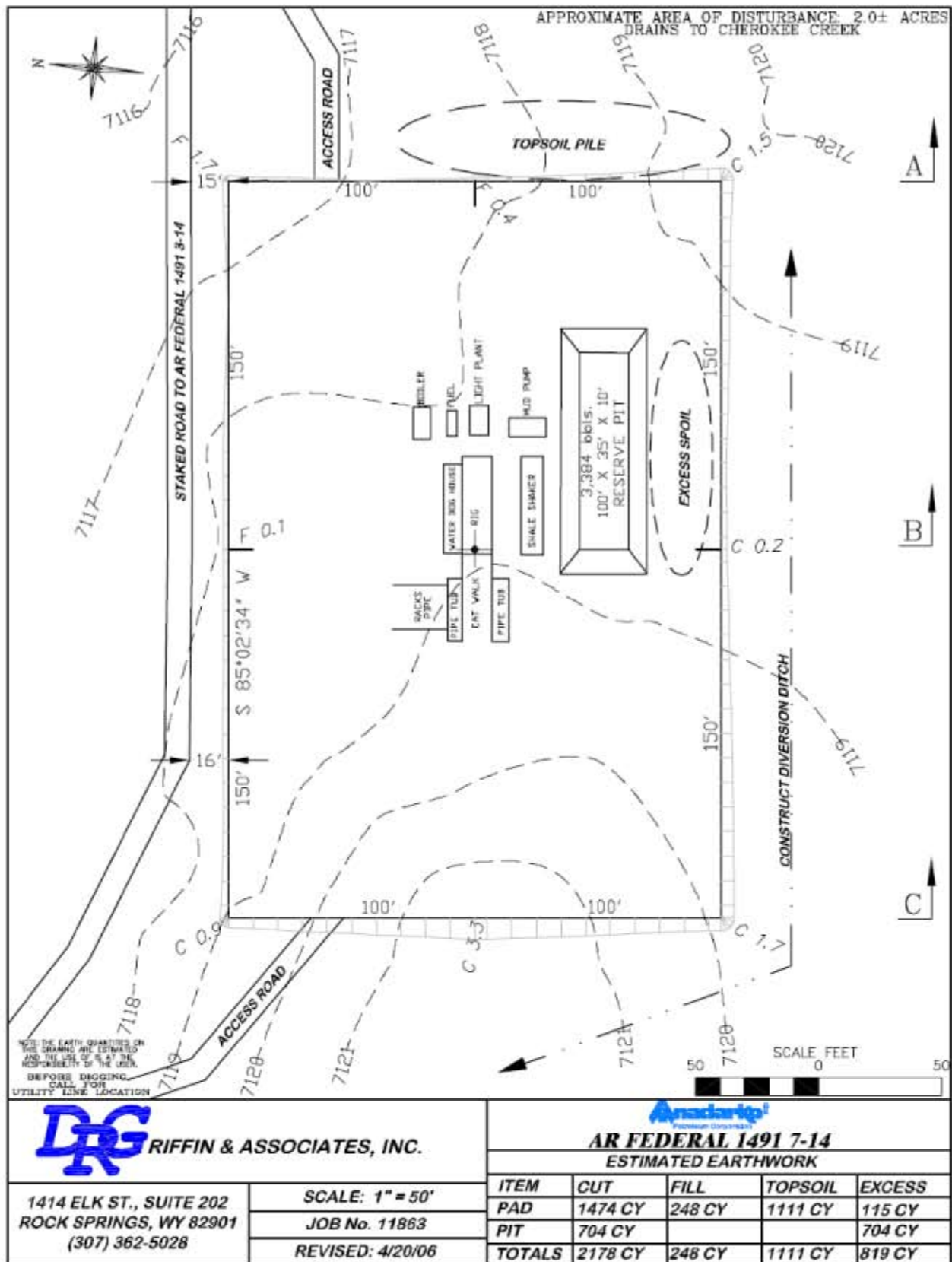


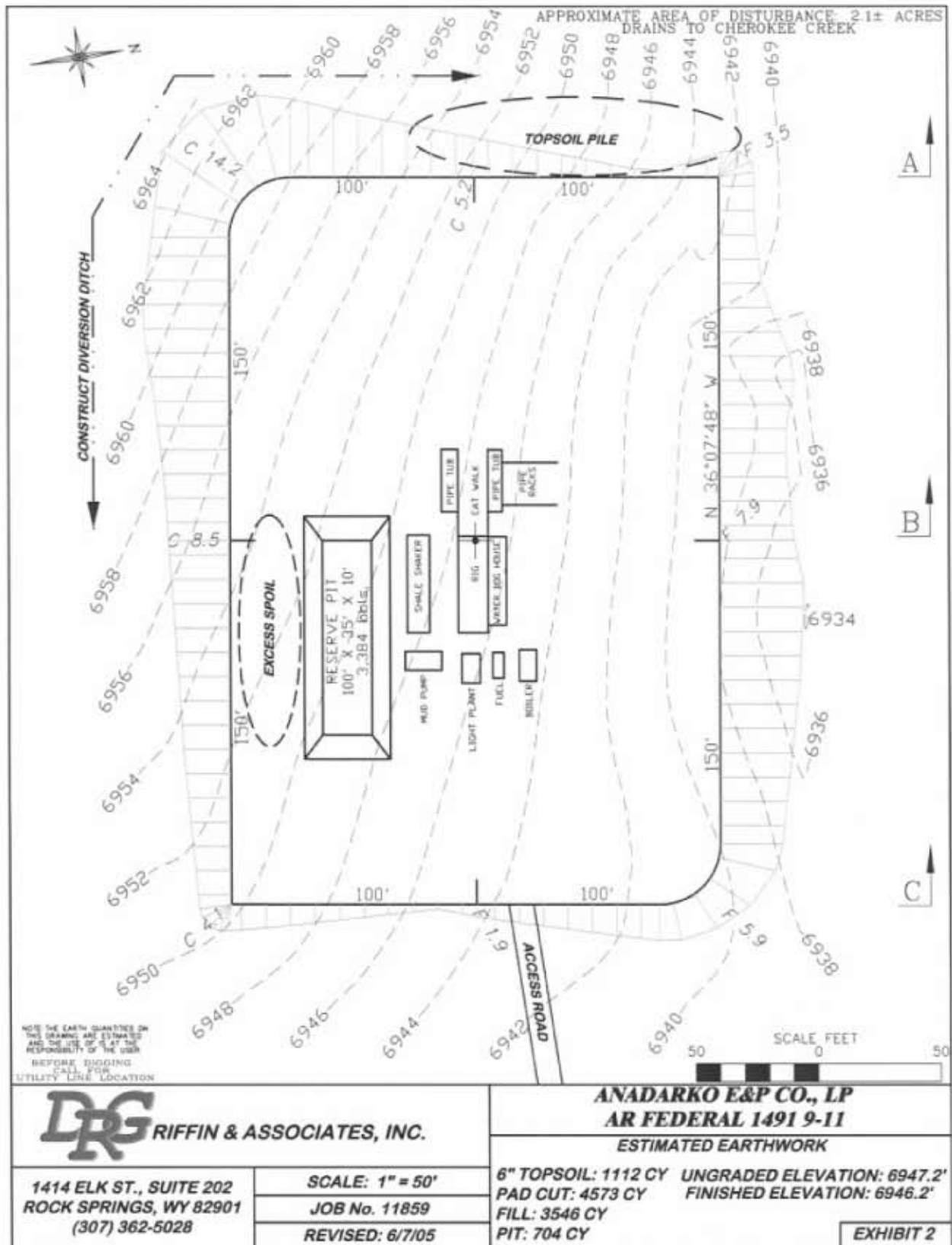


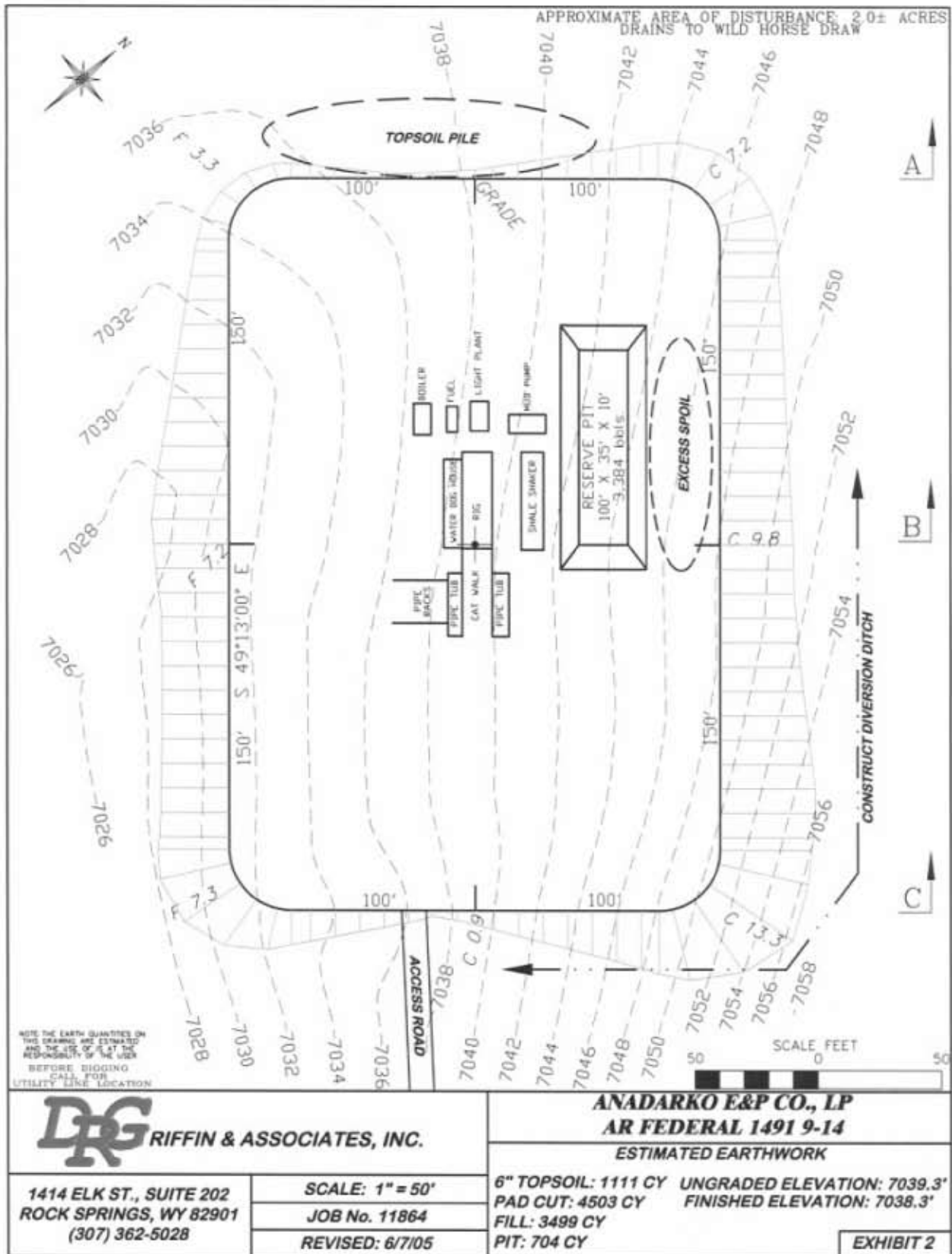












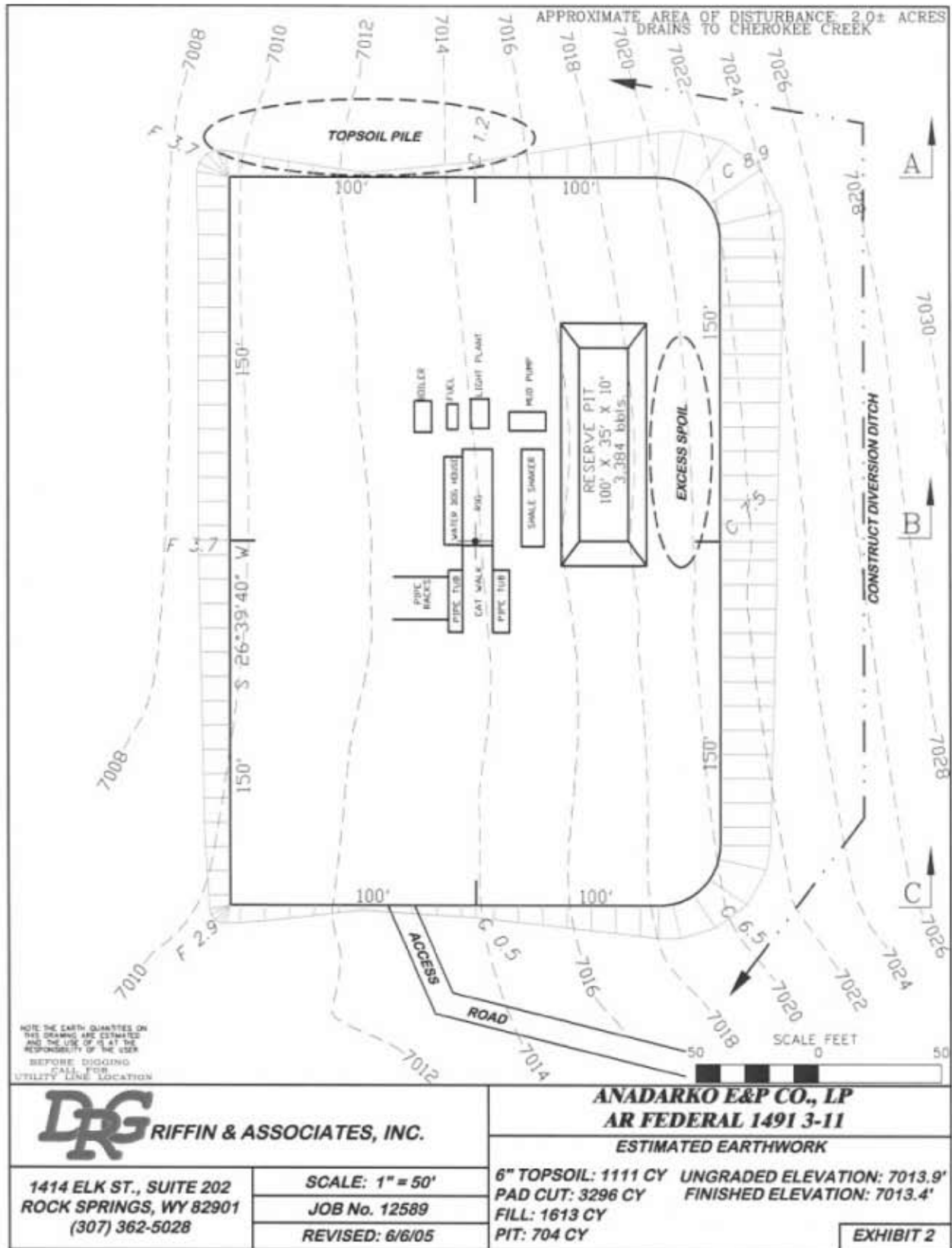
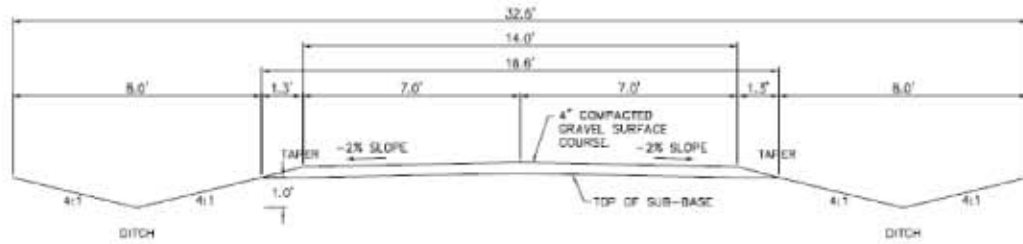


Exhibit 3
Access Road Plan and Profiles.

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PROPOSED ACCESS ROAD



RIP RAP IN BAR DITCH
(ONLY WHERE SPECIFIED)



WING DITCH (DETAIL)



RIP RAP IN WING DITCH (DETAIL)
(ONLY WHERE SPECIFIED)

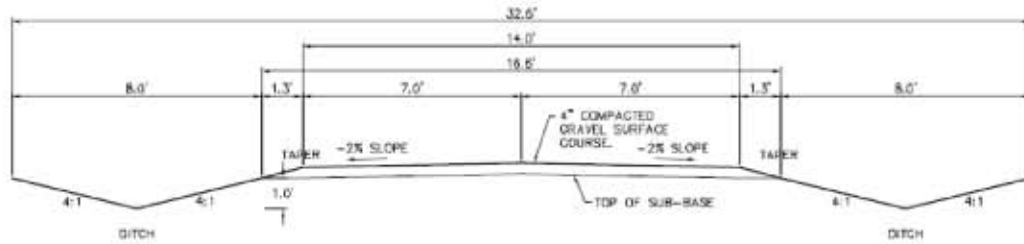


WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
PLAN
TURNOUT-WIDENING ON ONE SIDE (DETAIL) TURNOUT-WIDENING ON BOTH SIDES (DETAIL)

TYPICAL DETAILS

NOT TO SCALE

PAGE 3 of 8



PROPOSED ACCESS ROAD



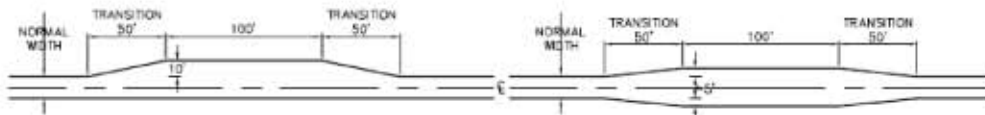
RIP RAP IN BAR DITCH
(ONLY WHERE SPECIFIED)



WING DITCH (DETAIL)



RIP RAP IN WING DITCH (DETAIL)
(ONLY WHERE SPECIFIED)



WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
PLAN
TURNOUT-WIDENING ON ONE SIDE
(DETAIL)

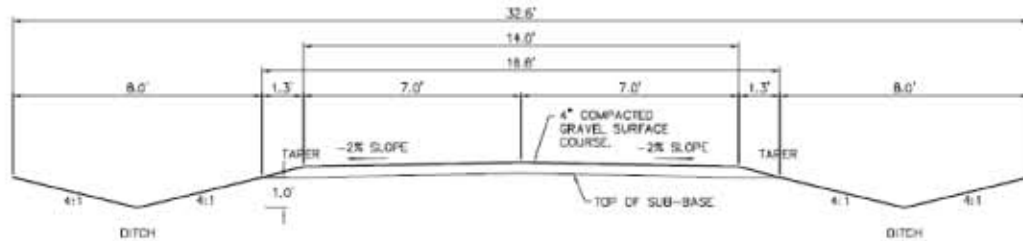


WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
PLAN
TURNOUT-WIDENING ON BOTH SIDES
(DETAIL)

TYPICAL DETAILS

NOT TO SCALE

PAGE 2 of 4



PROPOSED ACCESS ROAD



RIP RAP IN BAR DITCH
(ONLY WHERE SPECIFIED)



WING DITCH (DETAIL)



RIP RAP IN WING DITCH (DETAIL)
(ONLY WHERE SPECIFIED)



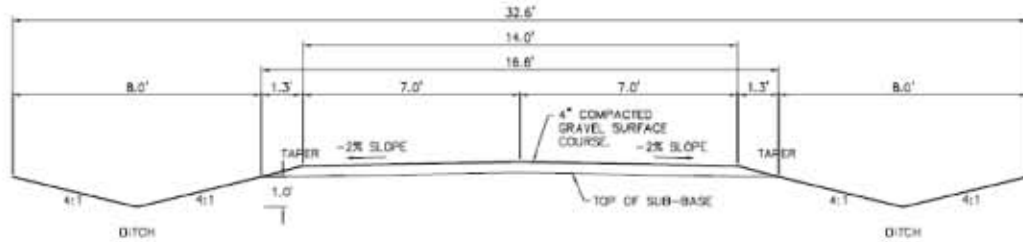
WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
PLAN
TURNOUT-WIDENING ON ONE SIDE
(DETAIL)

PLAN
TURNOUT-WIDENING ON BOTH SIDES
(DETAIL)

TYPICAL DETAILS

NOT TO SCALE

PAGE 2 of 6



PROPOSED ACCESS ROAD



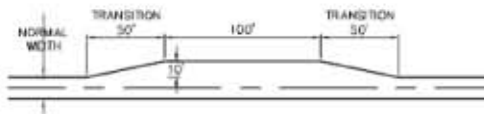
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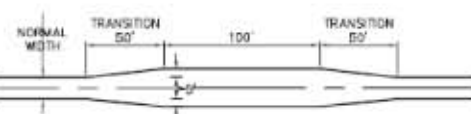
WING DITCH (DETAIL)



RIP RAP IN WING DITCH (DETAIL)
(ONLY WHERE SPECIFIED)



WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
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TURNOUT-WIDENING ON ONE SIDE
(DETAIL)

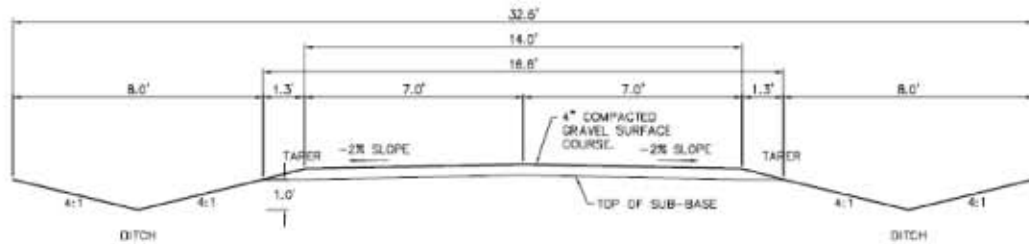


WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
PLAN
TURNOUT-WIDENING ON BOTH SIDES
(DETAIL)

TYPICAL DETAILS

NOT TO SCALE

PAGE 2 of 6



PROPOSED ACCESS ROAD



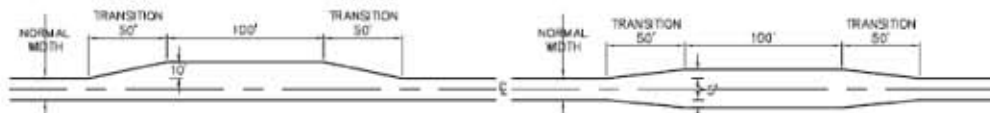
RIP RAP IN BAR DITCH
(ONLY WHERE SPECIFIED)



WING DITCH (DETAIL)



RIP RAP IN WING DITCH (DETAIL)
(ONLY WHERE SPECIFIED)

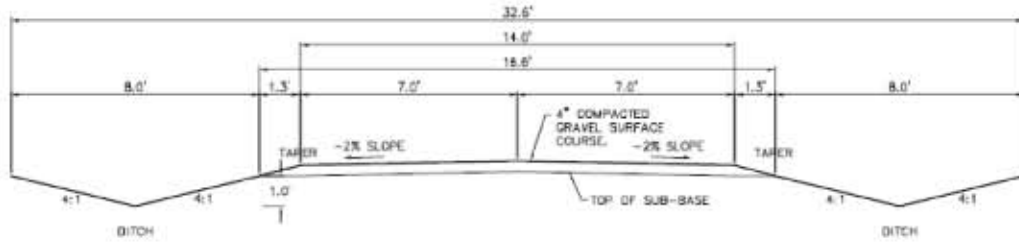


WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
PLAN
TURNOUT-WIDENING ON ONE SIDE (DETAIL) TURNOUT-WIDENING ON BOTH SIDES (DETAIL)

TYPICAL DETAILS

NOT TO SCALE

PAGE 2 of 4



PROPOSED ACCESS ROAD



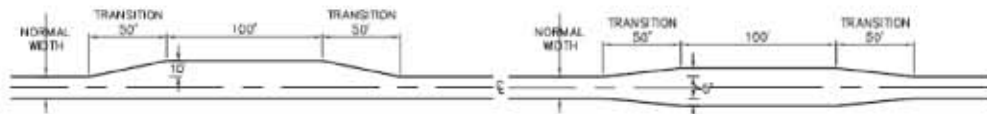
RIP RAP IN BAR DITCH
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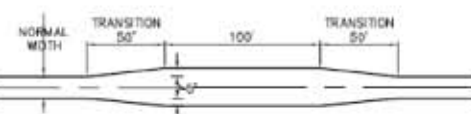
WING DITCH (DETAIL)



RIP RAP IN WING DITCH (DETAIL)
(ONLY WHERE SPECIFIED)



WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
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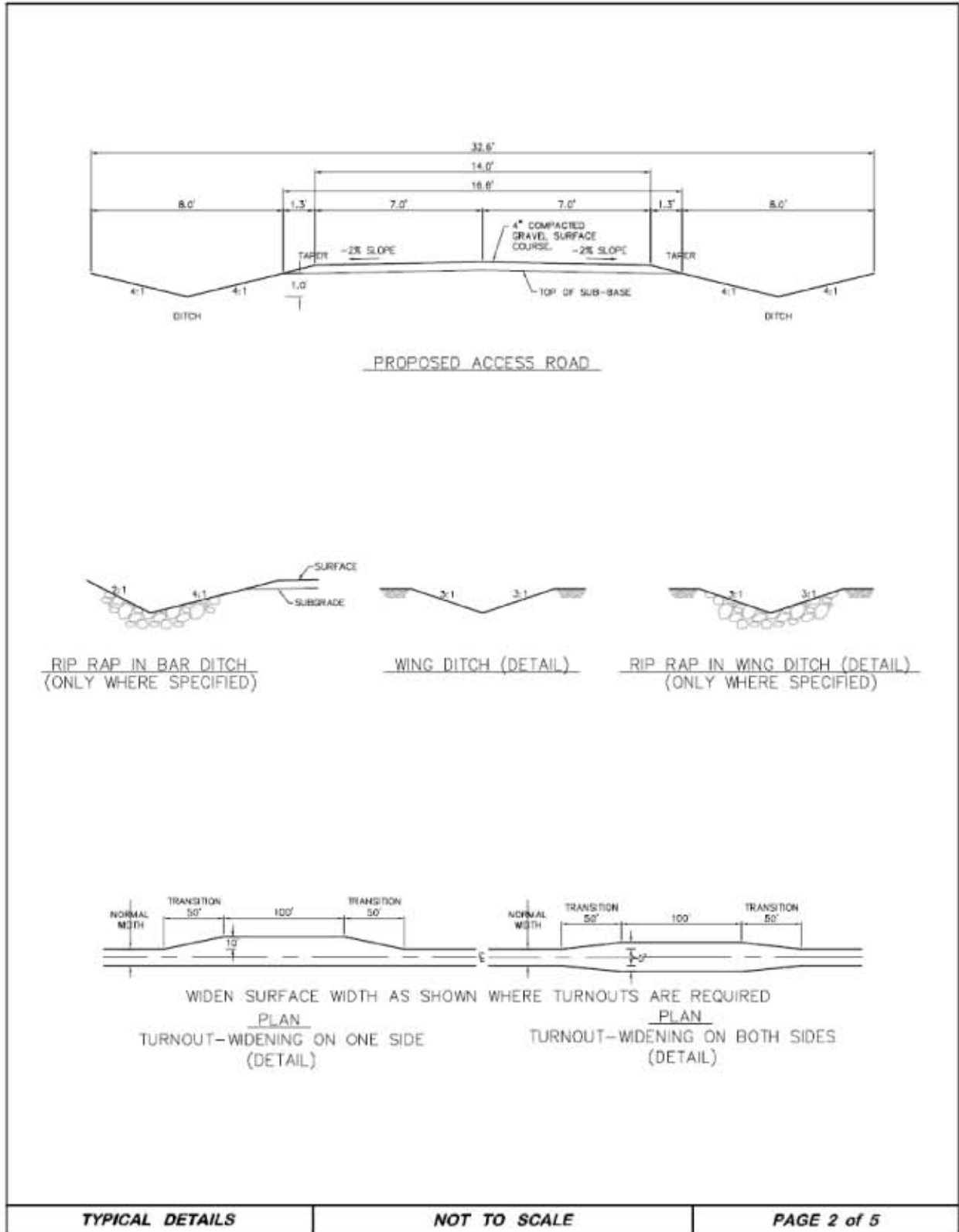


WIDEN SURFACE WIDTH AS SHOWN WHERE TURNOUTS ARE REQUIRED
PLAN
TURNOUT-WIDENING ON BOTH SIDES
(DETAIL)

TYPICAL DETAILS

NOT TO SCALE

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MASTER DRILLING PROGRAM

BROWN COW POD (12 Wells) Carbon County, Wyoming

AR Federal 1491 1-11	AR Federal 1491 3-11
AR Federal 1491 11-11	AR Federal 1491 3-14
AR Federal 1491 11-2	AR Federal 1491 7-11
AR Federal 1491 1-14	AR Federal 1491 7-14
AR Federal 1491 15-11	AR Federal 1491 9-11
AR Federal 1491 15-2	AR Federal 1491 9-14

1. ESTIMATED TOPS OF IMPORTANT GEOLOGIC MARKERS

<u>Formation</u>	<u>Shallowest Depth</u>		<u>Deepest Depth</u>	
	<u>Measured</u>	<u>Sub Sea</u>	<u>Measured</u>	<u>Sub Sea</u>
Almond	965	4,900	2,265	5,900
Pine Ridge	1,205	4,660	2,505	5,660
Allen Ridge	1,525	4,340	2,825	5,340
TD	2,025		3,325	

*See attached list for details.

2. ESTIMATED DEPTH OF ANTICIPATED WATER, OIL, GAS OR MINERAL FORMATION

- Primary Objective Pine Ridge Methane Gas
- Secondary Objective Allen Ridge Methane Gas
- Secondary Objective Almond Methane Gas
- Several coal seams may be tested for gas producing formations to total depth. All shallow water zones will be protected with casing and cement. Cement will be brought to surface to isolate formations.

3. MINIMUM BOP REQUIREMENTS (Refer to attached schematics)

- The BOPE shall be closed whenever the well is unattended.
- The BOPE shall be pressure tested when initially installed, whenever any seal subject to pressure testing is broken, after repairs, or every 30 days.
- Anadarko shall notify the Rawlins BLM office 24 hours prior to the BOPE test.

4. SUPPLEMENTARY INFORMATION

- The primary objective of this project is to drill, stimulate, and produce coalbed methane gas from the coal seams of the Mesa Verde Group Formations.
- Anadarko proposes to test the coal formations.

- c) Stimulation of the perforated coal seams will be done by hydraulic fracturing. Fresh water, gelled water, and/or foam fracturing techniques will be used.

5. CASING PROGRAM

Hole Size	Casing Size	Weight	Grade	Joint	Depth Set	New/Used	Collapse	Burst	Tension
12-1/4"	9-5/8"	32.3	H-40	ST&C	0-200 to 350	New	1370	2270	254M
8-3/4"	7"	23	MC-50	LT&C	0-TD	New	3100	3960	273M

Surface Casing:

- a) $\text{Burst} = 0.052 * \text{MW} * \text{TVD}(\text{shoe})$
 $= 0.052 * 10.0 \text{ ppg} * 350'$
 $= 182 \text{ psi}$
 $\text{Safety Factor} = \text{Rating/Burst}$
 $= 2270/182$
 $= 12.5$
- b) $\text{Collapse} = [0.052 * \text{MW} * \text{TVD}(\text{shoe})] - [\text{Gas Gradient} * \text{TVD}]$
 $= [0.052 * 10.0 \text{ ppg} * 350'] - [0.1 * 350']$
 $= 147 \text{ psi}$
 $\text{Safety Factor} = \text{Rating/Collapse}$
 $= 1370/147$
 $= 9.3$
- c) $\text{Tension} = \text{Weight} * \text{TVD} * [1 - (\text{MW}/65.5\text{ppg})]$
 $= 32.3 * 350' * [1 - 10.0/65.5]$
 $= 9,580 \text{ lbs.}$
 $\text{Safety Factor} = \text{Rating/Tension}$
 $= 254,000/9,580$
 $= 26.5$

Surface casing shall have centralizers on the bottom 3 joints of the casing, starting with the shoe joint.

Production Casing:

- a) $\text{Burst} = 0.052 * 13 \text{ ppg} * 3325'$
 $= 2248 \text{ psi}$
 $\text{Safety Factor} = \text{Rating/Burst}$
 $= 3960/2248$
 $= 1.76$
- b) $\text{Collapse} = [0.052 * 13 \text{ ppg} * 3325'] - [0.1 \text{ psi/ft} * 3325']$
 $= 1916 \text{ psi}$
 $\text{Safety Factor} = \text{Rating/Collapse}$
 $= 3110/1916$
 $= 1.62$

$$\begin{aligned}\text{c) Tension Weight} &= 23 \text{ lbs/ft} * 3325' * [1 - (13 \text{ ppg}/65.5 \text{ ppg})] \\ &= 23 \text{ lbs/ft} * 3325 * .8015 \\ &= 61,297 \text{ lbs}\end{aligned}$$

$$\begin{aligned}\text{Safety Factor} &= \text{Rating/Tension} \\ &= 273,000/61,297 \\ &= 4.45\end{aligned}$$

6. MUD PROGRAM

Drilling mud will be used as the circulation medium. A fresh water, polymer, gel drilling mud will be used and visual monitoring will be done from spud to total depth. The anticipated mud weight will be between 8.5-13 ppg. Sufficient quantities of lost circulation material and barite will be available at the well site at all times for the purpose of assuring well control.

7. CEMENTING PROGRAM

The following is the proposed procedure for cementing the 9-7/8" surface pipe and 7" long string:

9-5/8" Surface Casing:

Lead: Type III Cement with 2% CaCl₂ and .25/sk cello-flake, mixed at 14 ppg, 1.54 cuft/sk yield with 100% excess. 1550 psi compressive strength in 24 hours at 83° F.

The surface casing shall be cemented back to surface. In the event cement does not circulate to surface or fall back of the cement column occurs, remedial cementing shall be done to cement the casing back to surface.

7" Production Casing:

Lead: Premium Lite Plus Cement with 1% CaCl₂ and .25/sk cello-flake, mixed at 11 ppg, 3.18 cuft/sk yield, caliper volume plus 10%. 350 psi compressive strength in 48 hours at 114° F.

Tail: Premium Lite II High Strength Cement, mixed at 13 ppg, 1.89 cuft/sk yield, caliper volume plus 10%. 3700 psi compressive strength in 48 hours at 114° F.

Volumes calculated to circulate cement from TD to surface.

8. LOGGING PROGRAM

Cores:None

DSTs:None

Logs: From To

GR TDSurface

Resistivity TDSurface Casing

Neutron-Density-CalTD Surface Casing

High Res Pass TBD TBD

9. PRESSURE DATA, POTENTIAL HAZARDS

Bottom hole pressures anticipated at 1000-1100 psi

There is no history of hydrogen sulfide gas in the area and none is anticipated.

10. ANTICIPATED STARTING DATES AND NOTIFICATION OF OPERATIONS

a) Anticipated Days:

Drilling Days Approximately 7 Days/Well

Completion Days Approximately 2 Days/Well

Testing Days Approximately 7-14 Days/Well

b) Notification of Operations:

Bureau of Land Management

Rawlins Field Office

1300 North Third

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Rawlins, Wyoming 82301

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